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SOVIET CONCEPTS OF BALLISTIC MISSILE DEFENSE

by

Kevin Powell Seavey

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Thesis Advisor: David S. Yost

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The purpose of this thesis is to characterize the Soviet concept of ballistic missile defense (BMD) in order to better understand and predict future Soviet BMD decision making. The Soviet concept of BMD is fundamentally different from that in the West. Soviet BMD is clearly an integral component of a much larger Soviet strategic defense effort which consists of strategic air defense as well as passive measures, such as mobility, deep underground command and control facilities and civil defense. As the Soviet military literature demonstrates, Soviet strategic air defense encompasses defense against a continuum of threats -- from aircraft to ballistic missiles to satellites to "space-strike weapons." Soviet strategic air defense weapons therefore appear optimized to counter a wide range of airborne threats. In the Soviet view, surface-to-air missiles may be a primary tactical BMD weapon. Additionally, Soviet strategic BMD weapons may be a primary Soviet anti-satellite weapon. Furthermore, manned space platforms play a particularly significant role in Soviet thinking about the future of BMD and space warfare.

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Soviet Concepts of Ballistic Missile Defense

by

Kevin P. Seavey
Lieutenant, United States Navy
B.A., University of Washington, 1979

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Author: Kevin P. Seavey
Kevin P. Seavey

Approved By: David S. Yost
David S. Yost, Thesis Advisor

James G. Taylor
James G. Taylor, Second Reader

U. Kelz for R. Panholzer
Rudolph Panholzer, Chairman,
Space Systems Academic Group

G E Schacher
Gordon E. Schacher,
Dean of Science and Engineering

ABSTRACT

The purpose of this thesis is to characterize the Soviet concept of ballistic missile defense (BMD) in order to better understand and predict future Soviet BMD decision making. The Soviet concept of BMD is fundamentally different from that in the West. Soviet BMD is clearly an integral component of a much larger Soviet strategic defense effort which consists of strategic air defense as well as passive measures, such as mobility, deep underground command and control facilities and civil defense. As the Soviet military literature demonstrates, Soviet strategic air defense encompasses defense against a continuum of threats -- from aircraft to ballistic missiles to satellites to space-strike weapons. Soviet strategic air defense weapons therefore appear optimized to counter a wide range of airborne threats. In the Soviet view, surface-to-air missiles may be a primary tactical BMD weapon. Additionally, Soviet strategic BMD weapons may be a primary Soviet anti-satellite weapon. Furthermore, manned space platforms play a particularly significant role in Soviet thinking about the future of BMD and space warfare.

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I. INTRODUCTION

> Anti-missile defense can do almost nothing for a country subject to a nuclear surprise attack; it most suits an attacking country trying to reduce the strength of a retaliatory strike.
>
> -- Gennady Gerasimov, Soviet Foreign Ministry spokesman, July 1983 [Ref. 1:p. 7]

The Soviet ballistic missile defense (BMD) program has "tremendous power...in affecting perceptions of the strategic balance between the United States and the Soviet Union." [Ref. 2:p. 182] This "tremendous power" stems in large measure from the significant asymmetries that have developed over the last twenty years in U.S. and Soviet defenses against ballistic missile attack. During most of this time the United States has perceived BMD to be destabilizing, believing that mutual vulnerability to nuclear attack would effectively deter nuclear war and thus serve as a basis for international strategic stability. After signing the ABM Treaty in 1972, the U.S. pursued this vision by unilaterally rejecting deployment of nearly all defenses against ballistic missile attack, except for the few months in 1975-1976 that the Grand Forks Safeguard ABM site was operational.

The Soviet Union, on the other hand, has taken a considerably different approach. The Soviet leadership seems to have never accepted the peculiarly American logic of "mutual assured destruction" or, as they prefer to call it, the "balance of terror". Instead, mutual deterrence has been considered inherently unstable and undesirable because it suggests both a Soviet acceptance of the international political status quo and a Soviet denial of the peacetime political utility of the U.S.S.R.'s military power [Ref. 3:p. 13]. Since the end of World War II the

Soviets have, in fact, been embarked on a steady, incremental BMD program which now includes a nationwide infrastructure of early warning sensors and C^3 facilities, the world's only deployed BMD system around Moscow, a series of surface-to-air missiles (SAMs) with a potential capability against ballistic missiles, a formidable technology base for developing advanced BMD weapons, and launch capabilities for deploying such advanced military systems in space.

The continuing buildup of Soviet ballistic missile defenses could, if left unchecked, undermine the credibility and probable operational effectiveness of U.S. strategic retaliatory capabilities--especially at a time when the U.S. is pursuing a more technically demanding and operationally discriminate deterrent strategy which emphasizes selective counterforce targeting and escalation control. With a monopoly on effective defenses against ballistic missile attack, the Soviets "might come to believe that they could launch a nuclear attack against the United States or our allies without fear of effective retaliation--at the very least, they might see a realistic chance of successful nuclear blackmail." [Ref. 4:p. 51]

Soviet BMD is an integral part of the overall Soviet strategic defense effort. Along with antiaircraft and anti-satellite weapons, hardened ICBM silos and C^3 facilities, mobile ICBMs and a comprehensive system of deep underground leadership command facilities and related civil defense preparations, BMD contributes to the overall Soviet ability to fight and survive a nuclear war. It is the purpose of this thesis to characterize the Soviet concept of BMD in order to better understand and predict future Soviet BMD decision making. In order to do so, this thesis attempts to develop the conceptual basis of Soviet BMD, primarily through an analysis of open-source Soviet military writings. The unclassified Soviet military literature is the product of a centrally controlled Soviet system of military

research that produces and disseminates official Soviet definitions, terminology and views on nearly all aspects of Soviet military affairs. It was decided during the course of this research to use only unclassified sources, both Soviet and Western, in order to focus not on Soviet hardware, but instead on Soviet concepts of operations for their BMD forces, the military potential of BMD as defined by Soviet military science, and the role which BMD plays in Soviet warfighting strategy.

Due to the secretiveness of the Soviet system and Soviet desires to shape Western perceptions of their military capabilities, it is recognized that any analysis based on open Soviet literature is subject to distortions and omissions. Soviet *"maskirovka"* has done much in the past to conceal the true nature of Soviet military systems and operations from the West. Accordingly, the conclusions reached in this thesis should be weighed against data obtained through classified intelligence methods. Nevertheless, the analysis of open source Soviet military literature can yield crucial insights regarding the rationale for Soviet behavior which may not be obtainable through current technical means of intelligence collection.

In general, the Soviet concept of BMD is not the same as the Western concept, a distinction that will be fully developed in a later chapter. Soviet BMD clearly exists within the larger context of Soviet national air defense, which encompasses defense against all enemy air threats. Although reference is made to both U.S. and Soviet "BMD" throughout this thesis, the reader should bear in mind that Soviet thinking on defense against ballistic missile attack is fundamentally different from that in the Western alliance.

The Soviet concept of BMD as expressed in the open Soviet literature has unfortunately received inadequate attention in the West. This lack of attention has

often resulted in significant misunderstandings and miscalculations of Soviet intentions and goals, especially in arms control negotiations. It may, for example, be argued that conclusion of the 1972 ABM Treaty represented no basic change in Soviet ideas about the ultimate desirability of BMD. In August 1983 the Soviet Union submitted to the United Nations a draft "Treaty on the Prohibition of the Use of Force in Outer Space and from Outer Space against the Earth," which seeks to prohibit space-based weapons for antimissile, anti-satellite and surface strike missions [Ref 5:pp. 53-55]. Space-based weapons could, of course, play a significant role in future U.S. BMD system architectures and further restrictions on their development and potential deployment would greatly circumscribe the future of U.S. BMD. Would such restrictions, therefore, not equally limit the prospects for Soviet BMD? In order to better understand Soviet arms control goals in cases such as this, insights into Soviet thinking on BMD are very much needed.

This thesis is concerned primarily with the warfighting role of BMD in Soviet military strategy, although this warfighting role will be set within the context of overall Soviet political-military goals--including the Soviet interest in bringing about political change without armed conflict. Specifically, it will attempt to help answer the following questions:

(1) What is the Soviet concept of BMD? What is the role of BMD in Soviet military strategy? To what end is the vigorous Soviet BMD program directed?

(2) Why has the Soviet Union so persistently pursued BMD in the face of the relatively severe limitations imposed by the ABM Treaty? What is the potential for Soviet "breakout" or "creepout" from their ABM Treaty obligations? What effect might the deployment of U.S. BMD systems have on the Soviet program?

(3) Where is the Soviet BMD program headed? What role will new technological developments play in the future of Soviet BMD? What role will space and space weapons platforms play?

Chapter II will provide a background for discussion by providing an overview of the Soviet BMD program, identifying major trends in the development of systems and operations. Chapter III will then build on this historical framework by establishing the conceptual context of Soviet military doctrine in which Soviet BMD programs are generated. It will discuss the importance of national air defense in Soviet military doctrine, Soviet concepts of damage limitation, the relationship of offense and defense in Soviet military strategy, the probable wartime role of BMD, and the potential effect of BMD on the correlation of forces in a nuclear war as perceived by the Soviets.

Chapter IV will attempt to characterize the Soviet concept of BMD. It will discuss the larger Soviet concept of national air defense and outline Soviet views on the organization of BMD "forces and means" as well as the relationship of BMD to antiaircraft defense and antispace defense. Chapter V will then discuss possible future courses of development for Soviet BMD based on the Soviet concept of the role and utility of BMD. The potential for ABM Treaty "breakout" or "creepout" will be addressed, together with the issue of anti-tactical ballistic missile weapons (ATBMs) and the possible role of space in the future of Soviet BMD. Finally, Chapter VI will offer some general conclusions.

II. THE EVOLUTION OF SOVIET BALLISTIC MISSILE DEFENSE

A. THE EARLY YEARS OF SOVIET BMD

The Soviet BMD program can trace its beginnings to the years shortly after World War II. German air raids on Moscow and Leningrad during the war along with the post-war U.S. strategic bomber threat undoubtedly helped to make defense against air attack a high military priority in the Soviet Union. In 1948 the National Air Defense forces became an independent military service, organizationally the equal of the Ground Forces, Navy and Air Force. Around the same time a massive buildup of jet fighters, early warning radars and anti-aircraft artillery began. In 1952 the first surface-to-air missile, the SA-1, was introduced.

According to Sayre Stevens, "work on an actual BMD program evidently began in the late 1940s or early 1950s." [Ref. 2:p. 191] Nikita Khrushchev once stated that work on ICBMs and ABMs began simultaneously [Ref. 6]. During these early years, however, Soviet commentary on the possiblilities of effective BMD was decidedly pessimistic. Michael Deane quotes one Soviet author who wrote in the late 1950s that "the most effective defense against such long-range rockets is by means of their destruction in the storage places, in the process of transport, and on the launching platforms where the preparations for each firing takes a rather long time." [Ref. 3:p. 25]

The first actual evidence of Soviet work on ballistic missile defenses was obtained by U-2 photo-reconnaissance flights over the Sary Shagan missile test facility in Soviet Central Asia. One flight in 1958 detected the presence of

"primitive ABM radars" [Ref. 7:p. 152] while another in April 1960 revealed evidence of a "major program" underway which included the Hen House ballistic missile early warning radars, the soon-to-be-deployed Griffon system and the beginnings of the Moscow Galosh system [Ref. 2:p. 191].

Secluded deep in Kazakhstan, Sary Shagan proved to be ideally located as a BMD test facility. Because testing there could be conducted below the radio horizon of peripheral Western intelligence collection sites, it was difficult to monitor and thus assess Soviet BMD developments [Ref. 2:p. 196]. For this reason, the April 1960 flight was significant not only for the intelligence it obtained, but also for its good fortune, since it was the last operational U-2 mission prior to the May 1960 shootdown of Gary Powers [Ref. 2:p. 191]. Sary Shagan is also located about a thousand miles downrange from the ballistic missile test center at Kapustin Yar. In late 1961 the Soviet Union conducted a series of atmospheric nuclear tests, during which missiles were launched from Kapustin Yar towards an impact area at Sary Shagan. These tests provided an opportunity for operationally testing BMD radars and components as well as collecting engineering data on the effects of atmospheric blast and EMP. This emphasis on realistic, operational testing of their BMD system differed markedly from the U.S. approach of "gathering data in the hope that a wide range of specific operational conditions could then be derived from more basic data." [Ref. 2:p. 195]

The first operational deployment of a missile system attributed a possible BMD role was begun around Leningrad in 1962. The Griffon, which had previously been seen at Sary Shagan, was a two-stage endoatmospheric missile with a maximum slant range of about 100 miles [Ref. 3:p. 27]. Its deployment around Leningrad provided coverage of the city itself as well as the major ingress flight

routes for missiles launched against the western U.S.S.R. from the United States. Analysts continue to debate whether the Griffon was a BMD interceptor or merely a high altitude SAM designed to counter U.S. strategic bombers - or, in fact, a system designed to partially fulfill both missions. Relatively unsophisticated as a BMD system due to its limited data processing capability and missile performance, the Griffon seems nevertheless to have been praised as having resolved "the problem of destroying enemy missiles in flight." [Ref. 8:p. 27]

Although the program was halted shortly after deployment, the Griffon was a significant step for Soviet BMD efforts for two reasons. First, it demonstrated the Soviet method of deploying systems "as soon as possible, even if rudimentary and imperfect, so that a basis for developing more effective systems - through incremental improvements - might be established." [Ref. 9:p. 39] This strategy of deliberately fielding marginally effective systems, while concurrently developing upgrades and follow-ons, has allowed the Soviets to maintain an operational BMD system capable of performing at least some mission requirements since the early 1960s. In contrast, U.S. BMD efforts have historically been subject to very demanding measures of effectiveness which have helped to prevent the sustained deployment of any system whatsoever.

Second, the Griffon represents a distinct line of systems development for Soviet BMD hardware - that is, the improvement of air defense weapons to deal with the ballistic missile threat. According to Sayre Stevens, "[a]ll of the systems produced by this approach have a strong air-defense look and seem to seek an antiballistic missile capability through the strengthening of a basic anti-aircraft approach." [Ref. 2:p. 195] Surface-to-air missiles that are today assessed as having a possible BMD role (especially an anti-tactical ballistic missile (ATBM) role), such

as the SA-10 and SA-12, can in part trace their roots to the Leningrad Griffon. This development line seems to have proceeded quite independently of the Moscow BMD system, which emphasized large, radar-heavy installations with long-range, primarily exoatmospheric weapons.

The Moscow BMD system represents the second major development line for Soviet BMD systems. Although construction began around Moscow in October 1962, the system did not become operational until at least 1967 or early 1968 [Ref. 10:pp. 87-88]. Once operational the system consisted of: Hen House and Dog House radars for early warning and battle management; four launch complexes, radially located about fifty miles from the center of the city and equipped with the nuclear-armed Galosh missile; and other associated target tracking and missile guidance radars.

The Hen House radar network initially consisted of two of these large early warning radars, one located at Irkutsk, along the Barents coast, and the other in the Baltic republic of Latvia [Ref. 7:p. 158]. The Hen House system was supplemented by a large phased array radar in the Moscow area which came to be known as the Dog House radar. The Dog House was capable of providing target tracking and target acquisition information to the tracking and missile guidance radars located at the launch complexes.

Each of the four launch complexes housed two missile emplacements consisting of one large target tracking radar, two smaller missile guidance radars and eight above-ground launchers for the Galosh missile. The Galosh missile itself was publicly unveiled in the November 1964 parade. It was a long-range, exoatmospheric interceptor equipped with a nuclear warhead. Its range was at one point announced to be "hundreds of miles." [Ref. 10:p. 89] At this range, the

Galosh could theoretically provide an area defense for much of the western Soviet Union.

While the Moscow BMD system of the late 1960s might have proved somewhat effective in combatting a French, British or Chinese missile attack, it was quite limited in its ability to deal with a concerted American attack. The Hen House radar, operating at VHF frequencies, was extremely vulnerable to the effects of EMP and radar blackout, which could be caused by a precursor detonation from an attacking force or could be self-inflicted by the detonation of a defending Galosh warhead. Also, the early warning and target tracking radars themselves were extremely soft targets and any leakage at all of attacking missiles could have quickly eliminated critical components of the system. Another major weakness of the Moscow system was its limited data processing capability. This limitation meant that an attacker could saturate the system by offering more targets than the computers could simultaneously process. With the U.S. deployment of MIRVed ICBMs and SLBMs just on the horizon, the ability of missiles to penetrate the defenses by saturation appeared certain. Other significant drawbacks of the Moscow BMD system included its gaps in radar coverage along some attack corridors and its susceptibility to electronic countermeasures, such as chaff and decoys. Perhaps because of these limitations, work on the Moscow system was halted in 1968 with only four of the eight originally planned launch complexes completed.

B. SOVIET BMD AND THE ABM TREATY OF 1972

In view of the important role that BMD plays in Soviet war-fighting strategies along with the steady construction of a Soviet BMD capability just described, one might wonder why the Soviet Union was so eager to limit its BMD system by

signing the ABM Treaty with the United States. Prior to 1967 the Soviets had shown little enthusiasm for placing any limitation whatsoever on defensive weapons, yet by the time of the first SALT I session in Helsinki in November 1969, it was the Soviet negotiators who were pushing hard for constraints on BMD development. What factors brought about this shift in Soviet policy?

It seems clear that by the late 1960s a major reappraisal of the role of ballistic missile defense in general was taking place in the Soviet Union. Claims that Soviet interceptors could "hit a fly in outer space" [Ref. 11] gave way to more realistic assessments of BMD effectiveness. These new assessments appeared in an almost open debate in the Soviet press between senior Air Defense (*Voyska Protivovozdushnoy Oborony*, or V-PVO) officers and military officers of other services. While the V-PVO leadership continued to uphold the need for BMD and to trumpet the merits of the Moscow system, other Soviet leaders, including Defense Mininster Malinovsky, stressed the imperfectibility of BMD. In fact, these disagreements may have led to the dismissal of Marshal Sudets as V-PVO CINC in 1966.[1] Of perhaps telling significance, for the first time since 1963 the carefully orchestrated November 7th military parade in 1968 did not include media reference to BMD weapons. During this time too the Soviet leadership first announced its willingness to discuss limitations on defensive strategic weapons.

This decision to discuss limitations on its cherished BMD system was clearly a difficult one for the Soviet leadership. Reasons that have been put forth for this decision include: the ineffectiveness of the Moscow system against the new U.S. MIRV threat; the high cost of deploying large phased array radars and nationwide

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[1] For further discussion of this "debate" see Ref. 12: pp. 298-300

launch installations; West Germany's acceptance of the Nuclear Non-Proliferation Treaty and, therefore, the removal of the potential German IRBM threat; and a sudden, new found Soviet desire to curb strategic defenses in the interest of U.S.-Soviet stability.[2] These factors may in fact have all played some role in the decision. What to many analysts, however, seems to have been of overriding concern to the Soviet decision makers was a desire to place limits on the deployment of a more sophisticated U.S. BMD system in order to maintain their ability to carry out damage-limiting preemptive strikes.

It has been estimated that at the time of the ABM Treaty the U.S. enjoyed roughly a ten year lead over the Soviet Union in BMD technology [Ref. 2:p. 204]. Despite Soviet introduction of their own MIRVed ICBMs, deployment of a vastly superior U.S. BMD system, such as Safeguard, would have "threaten[ed] the Soviet Union's capability to acquire the preemptive counterforce capability that was the key to their damage-limitation doctrine and the element of that doctrine that seemed most achievable in the near term." [Ref. 2:p. 204] Faced with the tremendous cost of deploying a nationwide BMD system and realizing that when deployed this system would be technologically inferior to any U.S. system, the Soviets may have reasoned that a negotiated limit on BMD deployments was the most expedient decision for the forseeable future.

Political negotiation and detente have historically been effective Soviet strategies for preventing the West from capitalizing on its technological superiority. Not only does it undermine the West's will to compete in military affairs, but it also facilitates the Soviet acquisition of Western technology

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[2] For further discussion of this last factor, see Ref. 12

[Ref. 13:p. 27] Current Soviet initiatives to negotiate limits on weaponry in areas of relative Soviet inferiority, such as space weaponry, can be seen as part of a Soviet "long-term political strategy of detente and negotiation designed to preclude full realization by Western powers of their potential advantage in military-technical competition." [Ref. 13:p. 27]

The ABM Treaty, signed by President Nixon and General Secretary Brezhnev in Moscow on May 26, 1972, placed severe constraints on both Soviet and American BMD programs. Among other provisions, the treaty (as amended by the 1974 protocol):

(1) Restricts BMD deployments to only one BMD site per side, deployed either in the national capital area or in an area containing ICBM silos at least 1300 km from the national capital.

(2) Sets a limit of 100 launchers and 100 interceptor missiles at each site.

(3) Restricts the deployment of large phased array radars to BMD sites, BMD test ranges and areas along the periphery of the country, from which they must be oriented outward.

(4) Prohibits sea-based, air-based, space-based and land mobile BMD systems and components.

(5) Prohibits "rapid reload" BMD launchers.

(6) Includes an agreement that "in the event ABM systems based on other physical principles and including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars are created in the future, specific limitations on such systems and their components would be subject to discussion."[3]

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[3] Since October 1985, the U.S. has recognized "restrictive" and "broad" interpretations of the ABM Treaty. Under the more restrictive interpretation, development and testing of BMD systems based on "other physical principles" is allowed only for fixed land-based systems. The broader interpretation of the treaty allows such development and testing (but not deployment) regardless of basing mode. According to the Strategic Defense Initiative Organization, "the President has reserved the right to restructure the SDI Program to take full advantage of the broader bounds of the ABM Treaty." [Ref. 14: p. D-1, D-2]

(7) Prohibits the testing of surface-to-air missiles and other non-BMD launchers "in an ABM mode."

(8) Prohibits the transfer of BMD systems or components to third parties.

Meanwhile, the treaty does allow the modernization of existing BMD systems and components as well as a certain level of research and development in BMD technologies.

Since the signing of the ABM Treaty, American and Soviet BMD programs have diverged sharply. Funding for U.S. BMD declined dramatically in the years following the signing of the treaty, from $772 million in 1973 to $197 million in 1976 [Ref. 15:p. 344], while the Safeguard BMD site at Grand Forks, North Dakota, the one U.S. site permitted by the treaty, was deactivated in 1976. In contrast, the Soviet Union has maintained and modernized its Moscow BMD system and has continued an aggressive research program in advanced weapons technologies. As Minister of Defense Andrei Grechko emphasized to the Soviet Presidium in 1972, the ABM Treaty "does not place any limitations on carrying out research and experimental work directed towards solving the problems of defense of the country against nuclear missile attack." [Ref. 16] This divergence in approach to BMD has at present brought about a serious asymmetry in U.S. and Soviet strategic defense postures. In the following section the Soviet approach will be examined in detail.

C. SOVIET BMD SINCE THE ABM TREATY

The Soviet BMD system of today must be seen in the larger context of a dynamic, national strategic defense effort. The Soviet BMD system along with upgraded air defense weapons, including new and more capable fighters and SAMs, and refined orbital antisatellite (ASAT) weapons, increases the ability of Soviet

national air defense to parry an enemy's strategic attack. New mobile ICBMs, such as the road-mobile SS-25 and rail-mobile SS-X-24, and the Typhoon SSBN add significantly to the survivability of Soviet strategic weapons. Passive defenses, such as civil defense, a comprehensive system of hardened ICBM silos and deep underground leadership command facilities, industrial and population dispersion capabilities, and the Soviet penchant for strategic deception, all contribute to an ability to survive and recover from a nuclear attack.

As part of this nationwide strategic defense effort the Soviet BMD system has, within the general restrictions of the ABM Treaty, continued to grow and be modernized. Soviet BMD during the 1970s can perhaps best be characterized as follows:

> The level of activities at Sary Shagan continued much the same as before the treaty was signed. . . .The Soviet Union made no moves in the 1970s to [improve the Moscow BMD system], however, despite a decision to maintain the current system. Neither did it make any effort to increase the number of interceptors associated with the system up to the limit of 100 allowed by treaty provisions. Work on the peripheral network of early warning and acquisition radars continued. Slowly but surely the Soviet Union continued to fill existing gaps in the coverage it provided. In general, this activity had a flavor of steady, unfrenzied progress toward defined development goals. [Ref. 2:p. 211]

While the Soviet leadership, in signing the treaty, accepted certain restrictions on actual BMD deployments, they seem in no way to have given up their long term goal of "creating an invincible system for the defense of the entire country." [Ref. 17:p. 297] In fact, steady, unhurried Soviet research and development efforts in the 1970s and 1980s have in large measure closed the technology gap with the United

States in certain key technologies and laid the groundwork for a potential nationwide system of ground-based BMD interceptors.[4]

The most visible fruits of these Soviet efforts are their greatly expanded sensor systems for detecting ballistic missile launches. The current network of launch detection satellites and over-the-horizon radars can provide up to 30 minutes of early warning on U.S. missile launches [Ref. 19:p. 47]. The Hen House early warning radar network now consists of 11 radars at six sites along the Soviet periphery. In accordance with their practice of deploying systems of somewhat limited capabilities and then upgrading them in the field, the Soviets have steadily improved the capabilities of this radar since its initial deployment. The Hen House system is now augmented by a new system of long-range, phased array radars (LPARs) programmed for deployment at nine sites throughout the Soviet Union. Among these new LPARs is the radar at Krasnoyarsk in Siberia, which, because of its location and orientation, the U.S. government maintains is in direct violation of the provisions of the ABM Treaty [Ref. 20:p. 12].

This growing early warning system can provide target acquisition and target tracking services to both the fixed Moscow BMD system and also, perhaps more significantly, to the increasing number of potentially BMD-capable SAMs, such as the SA-5, SA-10 and SA-12. The U.S. Department of Defense estimates that early warning sensor data are being integrated and internetted in the Soviet air surveillance network for dissemination to SAM sites throughout the country [Ref. 19:p. 60].

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[4] As early as 1978, the U.S. Secretary of Defense concluded that "the lead enjoyed by the United States in BMD at the time we entered into the ABM Treaty has greatly diminished." [Ref. 18:p. 124]

The Moscow BMD system too has been steadily upgraded since the 1972 accords. While Soviet BMD, in general, is not focused solely on the Moscow area, the most visible Soviet BMD efforts have included a particular emphasis on protecting the national capital. Many analysts ascribe this preference for the protection of Moscow to a peculiar Russian preoccupation with the cultural and historical center of the motherland. A more practical consideration for the preferential defense of Moscow is the need to ensure Soviet NCA survivability. The Moscow BMD system along with the use of hardened underground command facilities in the Moscow area would greatly increase the survivability of key Party and military personnel in the event of war. As Stephen Meyer notes, "if there is a Soviet plan for NCA succession under surprise attack conditions, its implementation may depend on someone in Moscow surviving." [Ref. 21:p. 486] Additionally, the Moscow BMD system would raise the level of nuclear attack required to "decapitate" the Soviet leadership, dilute the effects of a British, French or Chinese attack and provide some insurance against an accidental nuclear launch. Finally, of course, and quite propitiously, deployment and upgrading of the Moscow BMD site is in accordance with the provisions of the ABM Treaty.

From the original, somewhat limited Galosh exoatmospheric system, the Moscow system is now growing into a full, two-layer defense system, composed of new battle management radars, improved Galosh exoatmospheric interceptors and new Gazelle endoatmospheric interceptors. This new Moscow system will for the first time bring the number of Soviet BMD launchers up to the treaty-limited 100 launchers and could be fully operational in the late 1980s [Ref. 19:p. 47].

A major element of the new Moscow system is the Pushkino radar, also known as the Pill Box. This radar is a large pyramid-shaped structure containing phased

arrays on each of its four faces which provides 360 degree coverage of approaching ballistic missiles. The Pill Box will probably perform target tracking and missile guidance services for the improved, silo-based Galosh and the new Gazelle interceptors. The Gazelle is a silo-based, high acceleration missile which now provides the Soviet Union with an ability to employ atmospheric sorting in discriminating decoys from reentry vehicles.

The designation ABM-X-3 has been applied to a new Soviet BMD system, including the new Flat Twin phased array radar and the silo-based Galosh and Gazelle interceptors. Because of the transportable nature of each of these components, the ABM-X-3 is seen as a rapidly deployable BMD system, possibly capable of deployment throughout the Soviet Union within several months. If the Soviets so choose at some later date, the ABM-X-3 gives them the capability to rapidly deploy a BMD system of generally limited effectiveness for nationwide defense but of significantly greater effectiveness for preferential defense of specific, critical leadership or military targets [Ref. 2:p. 214].

The improvements made in the Moscow system represent a continuation of the development line of large, relatively fixed BMD systems. In addition to upgrading the Moscow system, the Soviets have continued their efforts to improve air defense weapons for the BMD role. The new SA-10 and SA-12 SAMs incorporate many features considered necessary for short-range defense against ballistic missiles, such as automated launch commitment capabilities. The U.S. Department of Defense has concluded that the SA-10 and SA-X-12B/GIANT systems are capable of intercepting aircraft, cruise missiles, and tactical ballistic missiles and "may have the potential to intercept some types of strategic ballistic missiles." [Ref. 19:p. 50] The continued development and fielding of these SAM systems provides the Soviet

military with an *in situ* force potentially capable of performing a BMD role. According to Sayre Stevens, "the Soviet Union could have, with its new SAMs, a BMD capability able to enhance damage limitation that is not controlled by the ABM Treaty." The development of these strategic SAMs "constitute[s] the most disturbing change in the balance of U.S. and Soviet strategic defenses." [Ref. 2:pp. 214-216]

The Soviets are also carrying forward an aggressive research program in advanced technologies having direct application to BMD, including directed energy and kinetic energy weapons. In directed energy technology, the Soviets are exploring gas dynamic, electric discharge and chemical lasers, free electron lasers, neutral particle beams and radio frequency weapons. They have also demonstrated an experimental kinetic accelerator capable of accelerating small particles to velocities approaching 25 kilometers per second within the atmosphere and 60 kilometers per second in a vacuum. In the event of the ABM Treaty's demise, these technologies could form the basis for the next generation of Soviet BMD weapons and, according to the U.S. Defense Department, could begin to be deployed as prototype weapons before the end of the century. [Ref. 19:pp. 50-51]

Since the ABM Treaty imposes restrictions of "unlimited duration" on weapons deployments, this broad-based Soviet BMD program, in both "conventional" and "exotic" weapons, has ominous implications. Why would the Soviet Union invest so steadily and heavily in a weapons system which may never see battle? Different explanations have been offered for Soviet decision-making. Some analysts see Soviet "arms race" reactions to Western force postures as the primary reason for their BMD program, while others see the program as one resulting from powerful interest groups in the Soviet military bureaucracy who have given momentum to

an ill-conceived program. David Yost has offered an alternate explanation emphasizing "mission requirements" in Soviet force planning which "suggest[s] a higher degree of deliberate and central control over Soviet military investments." According to this interpretation, "Soviet behavior regarding BMD may be explained as an attempt to fulfill the demands of Soviet military doctrine within technological and political constraints - both external and internal." [Ref. 9:pp. 113 and 145 (emphasis added)]

To more fully appreciate Soviet BMD programs, therefore, it is crucial to understand Soviet military doctrine. To the Soviet leadership, political-military theory provides a framework for structuring their armed forces and planning the conduct of war. It is, as Lenin said, the "guide to action." Furthermore, Soviet military doctrine has long been recognized as an accurate indicator of trends in the force structure of the Soviet military. The role of BMD in Soviet military doctrine is the subject of the following chapter.

III. BALLISTIC MISSILE DEFENSE IN SOVIET MILITARY THOUGHT

A. THE ROLE OF SOVIET MILITARY DOCTRINE AND STRATEGY

As a first step in understanding the Soviet concept of BMD, it is important to understand the structure of Soviet military thought in which the concept of BMD is developed. Soviet authors are very precise in their use of terms such as doctrine and strategy, and these terms have much more specific meanings in the Soviet Union than in the West. Soviet military theorists have constructed an extensive conceptual framework for understanding military affairs (see Figure 3.1) within which they argue that military science can not only provide the means to solve problems of military affairs, but can also predict the course of their future development [Ref. 23:p. 5].

Soviet military doctrine represents the official policy of the Communist Party of the Soviet Union (CPSU) on war. Military doctrine is "a system of views adopted by a given state at a given time on the goals and nature of a possible future war and the preparation of the armed forces and the country for it, and also the methods of waging it." [Ref. 24:p. 37] Military doctrine is tasked with answering the following basic questions:

(1) What is the degree of probability of a future war, and with what enemy will one have to deal?

(2) What character might the war take which the country and its armed forces might be forced to wage?

(3) What goals and missions can be assigned to the armed forces in anticipation of such a war, and what armed forces must the nation possess in order to achieve the stated goals?

(4) Proceeding from this, how should the nation carry out military structuring to prepare the army and country for war?

(5) Finally, if war breaks out, by what methods should it be fought? [Ref. 25:p. 20]

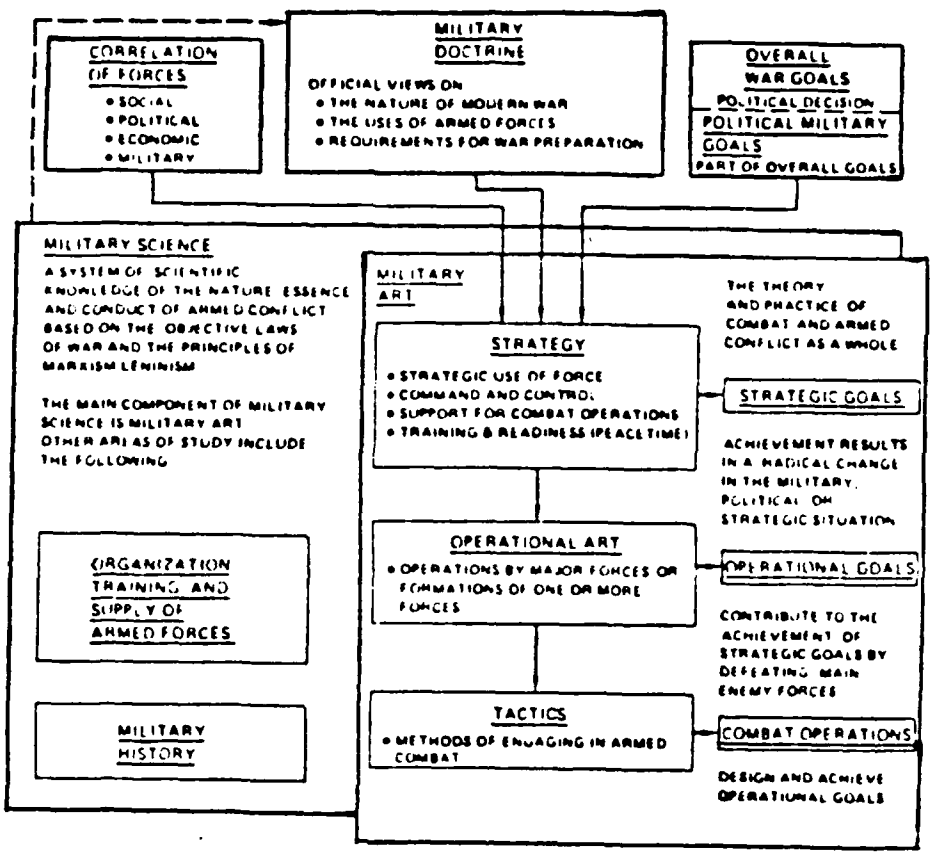

Figure 3.1 Principal Relationships in Soviet Military Terminology [Ref. 22:p. 69]

Military doctrine has two sides: (1) the socio-political side, which is based on the Marxist-Leninist theory of war and deals with preparing the nation's economic and social base for war, and (2) the military-technical side, which, in accordance with the socio-political goals, deals with preparing the nation's armed forces for war. The military-technical side has as one of its primary concerns the preparation of the nation for fighting and surviving a nuclear war. As Marshal Ogarkov, former Chief of the Soviet General Staff, writes:

> The most important position of the military-technical content of Soviet military doctrine, dictated by the rapid development of the nuclear rocket weapon and the possibility of its surprise use by the enemy, is the demand to maintain the Armed Forces of the USSR in high combat readiness guaranteeing their timely deployment for repulsing a surprise enemy attack, carrying out powerful retaliatory strikes on him and successfully fulfilling the set tasks in defense of the socialist fatherland. [Ref. 24:pp. 64-65]

Military science, on the other hand, is "a system of knowledge on the nature and laws of war, the preparation of the armed forces and the country for war and the methods of its conduct." [Ref. 23:p. 74] Unlike military doctrine, military science is an "objective" field of study open to practical analysis, a field in which differences of opinion may exist. It includes the theory of military art (which is itself composed of military strategy, operational art and tactics), the theory of troop control and troop structuring, the theory of military training and education, and the theory of military economics and rear services. Military doctrine and military science are interrelated in that doctrine may direct military science to investigate certain military theories. Conversely, new methods and characteristics of warfare may emerge over time, bringing about a necessary evolution of military doctrine [Ref. 26:p. 7].

Military strategy is that part of military art which "studies the foundations of the preparation and conduct of war and its campaigns as a whole. In practice it is policy's direct weapon. With respect to strategy, policy plays the leading and directing role." [Ref. 27:p. 75] Military strategy is, as Stephen Meyer explains, "the operational response to the requirements imposed by military doctrine." [Ref. 21:p. 472] One of the central tenets of Soviet military strategy, one that has remained virtually unchanged since the late 1950s, is that having the military force necessary to fight and win a nuclear war is the best way to deter such a war--and to ultimately prevail in that war should deterrence fail.

B. SOVIET MILITARY DOCTRINE, NUCLEAR WAR, AND STRATEGIC DEFENSE OF THE U.S.S.R.

At the Twentieth Party Congress in 1956, Nikita Khrushchev delivered his famous secret speech denouncing Stalin and calling for new thinking about questions of Soviet military science. In the late 1950s the Party and military leadership in the Soviet Union conducted a thorough examination of contemporary military problems and the probable nature of a future war. At that time the Soviet leadership concluded that nuclear weapons and long-range ballistic missiles had brought about a revolutionary change in the nature of warfare (the "revolution in military affairs") and that these new weapons would be the decisive factor in any future war. In his January 1960 speech before the Fourth Session of the Supreme Soviet of the U.S.S.R., Khrushchev outlined a new Soviet military doctrine in which "nuclear rocket weapons" played the central, decisive and almost exclusive role. [Ref. 28:pp. 41-49]

The concepts embodied in this new doctrine were elucidated over the next few years by Minister of Defense Marshal Malinovskiy and other authoritative Soviet

military spokesmen. According to Soviet doctrine of the early 1960s, a future global war with the West would inevitably take the form of a "nuclear rocket war" and the newly formed Strategic Rocket Forces would become "the main service of the Armed Forces." [Ref. 29:p. 120] In 1962 Marshal Malinovskiy explained how Soviet military doctrine then foresaw a future war:

> A future world war, if the imperialists succeed in unleashing it, will be a decisive armed clash of the opposed social systems: . . . it inevitably will be thermonuclear, a war in which the main means of destruction will be the nuclear weapon and the basic means of its delivery to the target, the rocket....Now war might arise without the traditional clearly threatening period, by surprise, as a result of the mass use of long-range rockets armed with powerful nuclear warheads. [Ref. 30:p. 46]

The new military doctrine of the early 1960s was further delineated in the 1962 volume, Military Strategy, prepared by a group of Soviet military officers under the direction of a former Chief of the Soviet General Staff, Marshal V.D. Sokolovskiy. Military Strategy was perhaps the most significant book written in the Soviet Union on military affairs since the end of World War II. It rejected many traditional military principles, such as the concentration of forces on the decisive axis, the economy of force and the concept of partial victory, and reflected the views expressed by Khrushchev and Malinovskiy that "a world war, if unleashed by the imperialists, will inevitably assume the nature of a nuclear-rocket war, i.e., a war in which the main means of destruction will be nuclear weapons, while the main means of delivering them to the target will be rockets." [Ref. 17:p. 194] Military Strategy explained the tremendous impact of the introduction of nuclear weapons as follows:

> The appearance of the nuclear rocket weapon radically changed previous concepts of the nature of war. Modern rocket war in its destructive and death-dealing potential cannot be compared with previous wars. Mass application of nuclear rocket weapons makes it possible within a very short

> time to force a country from the war, or a number of countries, even those with relatively large territories, well-developed economies, and populations on the order of tens of millions. [Ref. 17:p. 11]

After the ouster of Khrushchev in October 1964, however, Soviet military doctrine began to turn away from its almost exclusive emphasis on nuclear weapons. The massive, intercontinental employment of nuclear weapons at the outset of a war was no longer seen as inevitable. As General-Major Tyushkevich observed in 1978:

> After the October (1964) plenary session of [the] CPSU Central Committee, action was taken to correct certain mistaken views held in military research circles as a result of overestimating the capabilities of nuclear weapons, their effect on the nature of warfare, and their role in the further organizational development of the Armed Forces." [Ref. 31:p. 471]

Soviet writings since 1965 have increasingly reflected the belief that, while nuclear weapons still represent the decisive factor in any war between nuclear powers, future wars might conceivably be conducted with the limited use of nuclear weapons or with conventional weapons alone. As a 1968 article in the restricted journal of the Soviet General Staff concluded, "the possibility is not excluded of wars occurring with the use of conventional weapons, as well as the limited use of nuclear means in one or several theaters of military operations, or of a relatively protracted nuclear war using the capabilities of all types of armed forces." [Ref. 32:p. 59] The Soviets recognized too that if a future war could be fought below the level of intercontinental nuclear war, nuclear strikes against the Soviet Union itself might be avoided.

The possibility of limiting damage to the Soviet homeland by keeping warfare below the level of intercontinental nuclear war gave the Soviet leadership great incentives to develop plans and balanced forces for combat at the conventional and

limited-nuclear level [Ref. 33:p. 122] As early as 1966, in fact, the Soviets were seriously discussing a future war fought "with the use of conventional means of attack, but under threat of the use of nuclear weapons on the part of the enemy." [Ref. 34:p. 122] Limiting war to the conventional level would not only provide greater security to the Soviet homeland, but would also increase the probability of successful offensive operations by removing the disruptive effects on troop control and offensive rate of advance caused by the use of nuclear weapons [Ref. 33:p.

Containing a future war at the conventional level, of course, requires achieving and maintaining superiority over any potential enemy at both the theater and intercontinental nuclear level, a goal the U.S.S.R. pursued with great determination throughout the late 1960s and early 1970s. Since achieving strategic nuclear parity with the United States in the early 1970s, the Soviets have therefore come to believe that a future war with the West would not necessarily escalate into a global nuclear war and could, in fact, involve conventional weapons only. The expansion of nuclear arsenals on both sides has led to "certain changes in the interrelationship between war and politics" and a situation whereby "thermonuclear war cannot serve as an implement to achieve political goals." [Ref. 35:pp. 34 and 46] In 1985, General-Colonel M.A. Gareyev, Deputy Chief of the Soviet General Staff and currently considered to be the leading Soviet spokesman on military doctrine, published an explicit critique of certain conclusions set forth in Military Strategy. According to General Gareyev, due to the tremendous growth in the size and effectiveness of both U.S. and Soviet nuclear arsenals, the massive use of nuclear weapons in war was no longer inevitable. Gareyev argued that:

> In the 1960s and 1970s, the authors of this and many other books proceeded primarily from the view that a war, under all circumstances, would be waged employing nuclear weapons and military operations employing solely

> conventional weapons were viewed as a brief episode at the start of a war. However, the improvement and stockpiling of nuclear missile weapons have reached such limits where the massed employment of these weapons in a war can entail catastrophic consequences for both sides. . . Under these conditions, as is assumed in the West, there will be a greater opportunity for conducting a comparatively long war employing conventional weapons and primarily new types of high-precision weapons. The possibility of the initiating of a nuclear war by the imperialists is also not excluded. [Ref. 36:p. 216]

Significantly, Gareyev does not therefore conclude that the massive buildup of nuclear arsenals excludes the possibility of war. In fact, he recognizes the possibility of a protracted conventional war during which the West might initiate the use of nuclear weapons. Instead, due to the Soviet Union's capacity for nuclear retaliation, he concludes that the West would be deterred only from the massive use of nuclear weapons and that a Soviet victory could be achieved through "partial victories" in conventional or theater-nuclear combined-arms operations [Ref. 36:p. 217]. In particular, Gareyev emphasizes the deterrent role of the Strategic Rocket Forces, calling them "a sure means for restraining the imperialist aggressors; they are constantly ready for a devastating retaliatory strike." [Ref. 36:p. 276]

Despite changing Soviet perceptions on the probability of an intercontinental nuclear war, strategic nuclear strikes remain one of the primary strategic actions of the Soviet armed forces in the event of war. General-Lieutenant M.M. Kir'yan, a prominent Soviet military theoretician, wrote in 1985 that the three "basic forms of strategic action" are: (a) actions by strategic forces; (b) military actions on continental and maritime (oceanic) theaters; and (c) repulsion of aerospace attacks of the enemy and defense of the territory of the country from strikes by mass-destruction weapons." [Ref. 37:p. 61]

Soviet strategic nuclear attacks would have as their primary objectives the destruction of the enemy's strategic nuclear forces, his military-economic potential

and political-administrative centers [Ref. 17:p. 282]. While not openly advocating "preventive war" or a first-strike strategy, the Soviets emphasize that the initial period of war is the most decisive period. During this period preemption of an enemy's nuclear attack in order to limit damage to the Soviet Union itself is considered a crucial element in Soviet warfighting strategy. According to Military Strategy, "damage limiting" forces include both offensive and defensive forces: survivable strategic offensive forces which can "contribute to the 'damage limiting' by crushing the enemy's nuclear means of attack at the launch sites and bases"; national air defense forces, including antiaircraft defenses and ballistic missile defenses (and, although left unstated, probably antispace defense forces); antisubmarine warfare forces; and also civil defenses, capable of reducing "by about three times of the losses among the population from the consequences of the enemy's nuclear strikes." [Ref. 17:p. 63]

National air defense of the Soviet Union is part of the Soviet military's third major form of strategic actions and, as will be outlined in more detail in the following chapter, consists of integrated antiaircraft, antimissile and antispace defense. The most crucial role of national air defense in Soviet strategy is the protection of the rear areas of the country and groupings of the armed forces from nuclear attack. This idea is somewhat reminiscent of the first of Stalin's five "permanently operating factors" - protecting the stability of the rear. The 1963 edition of Military Strategy described this mission as follows:

> The basic means for protecting the interior of the country and groups of Armed Forces from enemy nuclear attacks are the National PVO [antiaircraft] and PRO [antimissile] Troops, and also civil defense forces. They have the task of creating an invincible system for the defense of the entire country, and also preparing measures for rapid removal of the results of enemy nuclear attacks. Such a system should be prepared beforehand, in

peacetime, and should be in a constant state of high combat readiness. [Ref. 17:p. 297]

Besides protecting the Soviet Union in the event of a nuclear attack, Soviet national air defense can also play a most significant role in "restraining" the West from nuclear escalation by helping to assure the survivability of Soviet nuclear forces and their associated command and control systems.[5] As one Soviet military author wrote in 1983, "modern concepts of non-nuclear war envisage the achievement of strategic results with conventional means together with readiness to repulse nuclear attack." [Ref. 39:p. 125 (emphasis added)]

Although Soviet public pronouncements have become more and more circumspect over the years, Soviet interest in national air defense as an effective instrument in the ongoing political-military competition with the West has remained relatively constant. Soviet commentary in the 1960s was most explicit in giving national air defense a major role in a future war. According to the authoritative 1962 reference work, Marxism-Leninism on War and Army, "the main role in the [nuclear rocket] war will be played by the Strategic Rocket Troops and also the Troops of PVO (air defense) and PRO (antimissile defense)." [Ref. 40:p. 45] Military Strategy observes:

> Military operations for the protection of the interior of the country and groups of the Armed Forces from aggressor nuclear attacks will have vast

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[5] "It is worth noting that the Soviets do not equate their concepts of deterrence--influencing enemy decisions for purposes of war-prevention and conflict limitation--with those in use in the West. The word *sderzhivanie* can be used to denote "containment" as well as "deterrence" or "keeping out" or "restraining," while the word *ustrashenie* has a more offensive connotation. As David Holloway notes, 'Of these two terms it is *sderzhivanie* , restraining or holding back, that is used to describe Soviet policy; when *ustrashenie* , intimidation, is used it is applied to Western policy." [Ref. 38:p. 551]

> scope in a modern war. The aim of these operations will be to ensure the vital activities of the socialist countries, their economy, the combat capability of the Armed Forces, and protection of the population. These ends can be achieved by decisive operations of the country's antiair, antimissile and antispace defenses aimed at repelling enemy aircraft and rocket attacks, the complete annihilation of attacking aircraft and rockets beyond the defended regions and objectives. [Ref. 17:p. 459 (emphasis added)]

Since the late-1960s, the tone of Soviet discussions on national air defense has been much more cautious and imprecise. However, national air defense, and particularly BMD, is still recognized as a primary Soviet wartime mission. In 1971, one Soviet officer wrote that, "under modern conditions, antimissile defense holds one of the most important places among the other measures of defending the state against attack by enemy nuclear missiles." [Ref. 41:p. 108] In the 1973 "Officer's Library" volume, Scientific-Technical Progress and the Revolution in Military Affairs, General-Colonel N.A. Lomov wrote, "the effect of nuclear weapons on the enemy's military and economic potential, as well as defense against enemy nuclear strikes comprise the most important task of armed combat under present-day conditions." [Ref. 42:p. 5] In 1985, General Gareyev added:

> In the course of a war, decisive significance will be assumed by the prompt launching of nuclear and fire strikes against the enemy and the skillful use of their results by the troops, by the combining of massed strikes with the dispersed location of the troops (forces) and by the organization of dependable defense against enemy weapons of mass destruction. [Ref. 36:p. 214 (emphasis added)]

More recent Soviet pronouncements on military doctrine have emphasized the importance of preventing war altogether, reflecting General Secretary Gorbachev's call for "new political thinking in the nuclear age." [Ref. 43:p. 10] In July 1987, Defense Minister Yazov explained that current Soviet doctrine contains "new views on force development and the problems of avoiding war." [Ref.

44:p. 10] As we have seen in the preceding chapter, this shift to a political strategy of reducing military confrontation with the West has profound implications for the overall U.S.-Soviet military competition, especially with regard to ballistic missile defenses. These implications include: an undermining of the West's determination to support required military spending, especially on ambitious, long-term programs such as SDI; an infusion of Western resources (capital and technology) into the Soviet economy, which both directly and indirectly enriches the Soviet military technology base; and an increase in Soviet commercial access to Western technology. Soviet military doctrine under Gorbachev has "clearly been designed to reduce international tensions and provide breathing space for the Gorbachev restructuring programs to take effect." [Ref. 45:p. 104] This new doctrine, however, in no way rejects Soviet views on the nature of war and the necessity for the Soviet armed forces to prepare to fight a conventional war under the constant threat of an enemy's use of nuclear weapons. Moreover, it in no way rejects long-held Soviet views on the inevitability of competition with the West and the continued need for sufficient military power to fight and prevail in the event of war.

C. BMD AND THE DIALECTIC OF OFFENSE AND DEFENSE

According to Soviet military doctrine, war encompasses a broad spectrum of dynamic offensive and defensive military operations. In Soviet thinking, there exist strong bonds between the offense and the defense--bonds which are historically rooted in Marxist-Leninist theory and practical military considerations:

> The offensive and defensive represent two sides of the single process of armed conflict. In their goals and content, they are opposites but at the same time they are in close dialectical connection and have a mutual influence on

each other. New procedures and methods of actions which are employed by the troops in the offensive sooner or later cause the defender's methods of counteraction which correspond to them. In exactly the same manner, changes in the nature of the defense and methods of its conduct have a direct influence on the attack. [Ref. 46:p. 51]

In the Soviet view, new means of offense inevitably give rise to new means of defense, which in turn prompt the development of further offensive weapons. This dialectic process is just as valid today in the era of nuclear weapons. According to Colonel V.M. Bondarenko, a military theorist at the Lenin Military Political Academy:

> If potential opponents possess weapons of mutual destruction, decisive advantage goes to that side which first manages to create a defense from it. The history of military arms development is full of examples in which weapons which seemed irresistable and frightening are, after some time, opposed by a sufficiently reliable means of defense. Thus, an absolute limit to the development of military power . . . cannot exist." [Ref. 47:p. 145]

This theme was echoed by Marshal Ogarkov's 1982 work, Always in Readiness to Defend the Fatherland:

> The experience of past wars persuasively attests to the fact that the development of new offensive weapons has always inevitably led to the development of corresponding countermeasures . . . This also applies in full measure to nuclear missile weapons, the creation and rapid growth of which compelled military-scientific theory and practice actively to develop means and methods of countering these weapons. . . The constant contest between means of attack and means of protection . . . is one of the leading sources of development of military affairs as a whole. [Ref. 48:p. 21]

After the introduction of nuclear weapons, the offense enjoyed clear primacy over the defense in Soviet military thinking. Offensive operations in general are still seen as the primary method of achieving victory in war. Offensive operations can be conducted at various levels of military action - strategic, operational or tactical - with or without nuclear weapons and are "the only type of combat actions

of troops, the employment of which attains the complete rout of the enemy and the seizure of important objectives and areas." [Ref. 49:p. 1] In the Soviet view, strategic offensive operations are carried out to achieve a particular military-political goal of the war, such as destruction of enemy strategic groupings or withdrawal of individual states of an enemy coalition from the war [Ref. 27:p. 90].

Strategic defense, like strategic offense, has a somewhat broader meaning in the Soviet Union than it does in the United States. According to the 1986 Soviet Military Encyclopedic Dictionary, strategic defense is "an aspect of military action of the Armed Forces, used with the goal of repelling the strategic attack by formations of the enemy." It is interesting to note that in Soviet thinking, strategic defense implies not only repelling an attack and thereby protecting vital areas of one's own territory, but also "creating conditions for seizing the strategic initiative" and transitioning to the attack [Ref. 50:p. 710]. According to the same source, strategic defense forces include "systems warning of a nuclear missile strike, and antispace and antimissile defense forces and means." [Ref. 51:p. 711] In wartime it would be the primary purpose of these forces to "assure the frustration of the aggressive intentions of the enemy and his complete destruction by subsequent operations." [Ref. 17:p. 280]

In 1962, Military Strategy voiced the prevailing view that "the methods and means of nuclear attack unquestionably predominate over the methods and means of protection against them." [Ref. 17:p. 204] Ten years later, however, an authoritative Soviet spokesman pointed out that the current state of offensive predominance was not necessarily permanent. In his 1972 criticism of "nuclear fatalism", Colonel A.A. Shirman faulted the "acknowledgement of the

overwhelming superiority of modern offensive weapons over defensive weapons." He continued:

> Nor should one dogmatically absolutize the correlation between offensive and defensive weapons which prevailed at the initial stage of the present military technological revolution. History attests to the fact that there are no offensive weapons which cannot in time be countered with effective defensive weapons. The correlation between offensive and defensive weapons changed and will continue to change along with development of the military. This is attested, for example, by extensive efforts in the area of developing latest-generation air defense systems, improvement of civil defense, etc. . . An improvement in the effectiveness of means of defense may substantially reduce the scale of casualties and destruction connected with the employment of nuclear weapons. [Ref. 35:pp. 127-128 (emphasis added)]

By the mid-1970s, Soviet military theory had come to reflect a synthesis of strategic offense and defense and at the level of general nuclear war no longer clearly distinguished between strategic offense and strategic defense [Ref. 21:p. 471]. According to a 1980 article in Military Thought, the restricted journal of the Soviet General Staff, "in the classification of combat means according to their current effects in combat, the line dividing those means into offense or defense depending on their combat nature is becoming less distinct." [Ref. 52:p. 18] This synthesis may have been the result of Soviet perceptions of the objective technological conditions of current offensive and defensive strategic systems.

In Soviet eyes, the U.S. Strategic Defense Initiative, initiated in March 1983, threatens to upset this delicate balance of offense and defense by ultimately leading to the development of new means of offense. Andrei Kokoshin, Deputy Director of the Institute of the U.S.A. and Canada, wrote in 1985 that space-based weapons will inevitably lead to the development of "systems for resisting those weapons, after which more weapons to combat those weapons will appear." [Ref. 53:p. 4] In a 1985 interview with *Pravda* , General Secretary Gorbachev observed that, "just as

the emergence of nuclear weapons . . . only generated an intensified race in nuclear and conventional arms, so the creation of space weapons will have but one result: the arms race will become even more intensive and will encompass new spheres." [Ref. 54:p. 1] In the same year, Marshal Sokolov, then Soviet Minister of Defense, stated that "only mutual restraint in the sphere of ABM systems can contain the arms race and make it possible to advance along the road of limiting and reducing strategic offensive weapons." [Ref. 55:p. 4]

D. BMD AND THE CORRELATION OF FORCES IN NUCLEAR WAR

The calculation of the "correlation of forces" is a cornerstone of Soviet strategic planning and is the basis for both political and military decision making. The Soviets have developed mathematical models for calculating the "correlation of forces" in nuclear war in which BMD is a significant factor. Writing in Military Thought in 1967, General-Major I.I. Anureyev, a department head at the Voroshilov General Staff Academy and a leading Soviet expert on BMD and antispace defense, presented a dynamic nuclear exchange model which calculated the correlation of forces following a preemptive nuclear strike. The model included both strategic offensive and strategic defensive forces and factored in weapons reliability, force alert status and BMD effectiveness. Anureyev explained that "a sharp change in the correlation of forces to one's own advantage can be achieved by means of the mass application of nuclear weapons with the simultaneous repulsing of a sudden attack by the air-space means of the enemy." [Ref. 56:p. 164] This model received significant attention in the restricted Soviet military literature and seems in general to accurately represent Soviet strategic planning. The analytical model is given by:

$$L = \frac{L_o \sum_i (\mu^2_{in})^{1/3} \cdot W_{in} \cdot W_{in}^3}{\sum_j (\mu^2_{jn})^{1/3} \cdot W_{jn} \cdot W_{jn}^3}$$

where:

$L_o = (Q_H^2/Q_P^2)^{1/3}$
= the initial correlation of forces in nuclear weapons
(Q_H^2 = total TNT equivalent of side H (friendly [Soviet]))
(Q_P^2 = total TNT equivalent of side P (enemy))

$\mu_{in} = Q_{in}/Q_H$ = portion of TNT equivalent delivered by i-type delivery vehicle of friendly side [Soviet]

$\mu_{jn} = Q_{jn}/Q_P$ = portion of TNT equivalent delivered by j-type delivery vehicle of enemy side

W_{in} = probability of i-type delivery vehicle of friendly [Soviet] side overcoming enemy defense

W_{in3} = probability of nondestruction of i-type delivery vehicle of riendly [Soviet] side on ground

W_{jn} : W_{jn3} = same values respectively, only for enemy side

It is interesting to note that according to this model any BMD effectiveness whatsoever, unmatched by the other side, will serve to change the correlation of forces in one's favor. More importantly, in confronting an enemy who does not have a defense against ballistic missile attack, this model clearly demonstrates the Soviet belief that the correlation of forces will increase in their favor with only small increases in the effectiveness of their own BMD system. In fact, disregarding the other terms, with no corresponding U.S. BMD system (W_{in}= 1.0), the

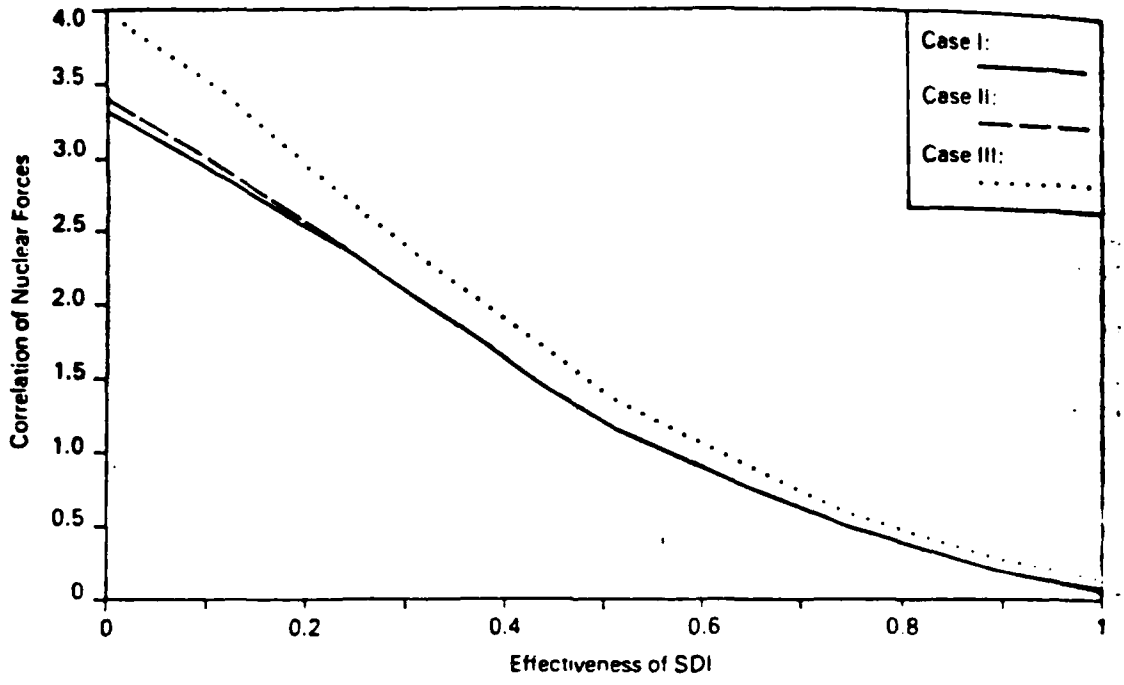
correlation of forces increases exponentially in the Soviet favor as the effectiveness of their own defensive system increases. Assuming no U.S. defenses, even a Soviet BMD sytem that is only 25% effective (W_{jn} = .75) would increase the correlation of forces in the Soviet favor by 33%. One that is 50% effective would fully double the initial correlation. Conversely, deployment of an effective U.S. BMD system would quickly negate this Soviet advantage. The keen Soviet interest in preventing or limiting SDI deployment is therefore quite understandable.

Stephen Meyer has constructed a hypothetical Soviet model of the nulcear correlation of forces which uses the Anureyev analytical model and represents the correlation of forces as Soviet strategic planners might see it in the late 1990s [Ref. 57]. The analysis uses recently declassified CIA estimates of Soviet force levels for the year 1994 and Congressional projections of U.S. force levels. According to Meyer's analysis, the correlation of forces following a Soviet preemptive attack with mid-1990's forces would be 3.4-4.0 in the Soviet favor, depending on Soviet force alert status and Moscow BMD effectiveness. This figure assumes no U.S. BMD system. Since the correlation of forces is a function of U.S. BMD effectiveness, U.S. BMD deployment would decrease the correlation to a point where, with a 60% effective U.S. BMD system deployed, the correlation of forces would be 1.0, "indicating that a full-scale Soviet pre-emptive (or, first) strike against the US would achieve little beyond second-strike nuclear parity." [Ref. 57:p. 284] U.S. BMD effectiveness above 60% would tilt the correlation of forces in the American favor. This relationship is shown graphically in Figure 3.2.

The Anureyev correlation of forces model is also consistent with Soviet policy statements on the effectiveness of BMD systems. Despite fantastic claims by Khrushchev and others to the contrary in the early 1960's, BMD, along with air

defense, space defense and civil defense, contributes to the overall strategic defense effort even though it may never itself approach 100% effectiveness. As one Soviet spokesman has justified their civil defense program, "To save just 1 percent of the Soviet population would mean to save 3 million people. No one in this country would understand the government if it failed to strive for this." [Ref. 58:p. V-1] Any amount of damage limitation is valued - therefore any amount of BMD effectiveness is good, as the Anureyev model most clearly demonstrates. Thus, in the context of a preemptive strategy, the primary role of Soviet strategic defenses might be to limit damage caused by "the forces remaining to the United States after a preemptive strike." In fact, "such a mission could significantly reduce the technical requirements put upon a BMD system. BMD does not have to carry the brunt of thwarting an enemy attack." [Ref. 2:p. 187] Even an imperfect Soviet BMD system could therefore play a critical role in ensuring the survival of the Soviet Union as a political system, a functioning society and a post-war military power. More importantly, an initially limited Soviet BMD system can be incrementally improved over time.

In summary, strategic offense and strategic defense are both integral parts of Soviet military doctrine and strategy. While the offense has enjoyed predominance over the defense since the introduction of nuclear weapons, this predominance has not ruled out a continued and vigorous Soviet strategic defense effort. Moreover, this strategic defense effort occurs not in opposition to strategic offense, but "within the context of a continued parallel stress on the necessity for overwhelming offensive forces." [Ref. 59:p. viii] Offense and defense are thus inexorably linked in Soviet warfighting strategies.



Case I -- Soviet force estimates at peacetime readiness levels
Case II -- Case I forces plus Soviet SSBNs at 50% alert; strategic aircraft at 30% alert; air defense effectiveness at 25%
Case III -- Case II forces and readiness levels plus Soviet BMD effectiveness at 15%

Figure 3.2 Soviet Correlation of Nuclear Forces vs. SDI Effectiveness [Ref. 57:p. 284]

The Soviets have never resigned themselves to the American concept of "mutual assured destruction", but rather have attempted to arm themselves for conducting and surviving a nuclear war. A key element in Soviet nuclear warfighting strategy is damage limitation. With the coming of nuclear parity, the Soviets have recognized that even a preemptive strike against U.S. strategic forces could not hope to avert the dangers of nuclear retaliation. Therefore, in order to

defeat the United States in the event of war while at the same time preserving the Soviet Union as a viable society and the dominant power in the post-war world, defense against ballistic missile attack has become crucial. As Marshal of Aviation G.V. Zimin, Commandant of the Zhukov Military Command Academy of Air Defense, wrote in 1976, "now victory or defeat in war has become dependent on how much the state is in a position to reliably defend the important objects on its territory from the destruction of strikes from air or space." [Ref. 60:p. 127 (emphasis added)]

Additionally, the fundamental connection in Soviet thinking between offense and defense has profound implications for Soviet weapons acquisition strategies and force structures. The Soviets recognize the inevitable and often "revolutionary" advancement of military technology and believe that "the side which first creates an antimissile (antispace) defense will have a most important strategic advantage which would allow the threatening of war or its unleashing without fear of the enemy's retaliatory strikes." [Ref. 17:p. 91 (emphasis added)] Continued advances in BMD technology, as part of what they perceive to be the historical dialectic of offense and defense, are to be expected and exploited.

Furthermore, the Soviets would appear to be extremely unlikely to forego research and development in strategic defenses merely because of the current predominance of offensive strategic nuclear weapons. While the U.S. chose to downgrade investments in ballistic missile defense activities for several years after signing the ABM Treaty in 1972, even a cursory look at Soviet strategic defense programs over the same time reveals a steady, purposeful effort to provide the U.S.S.R. with some measure of defense against ballistic missile attack. Therefore, despite the limitations imposed by the ABM Treaty on BMD deployments, ballistic

missile defenses will in all likelihood continue to play a crucial role in Soviet military strategy. In order to better understand and estimate just how the Soviet BMD program might develop in the future, it is first necessary to examine in some detail the Soviet concepts of national air defense and ballistic missile defense as defined by Soviet military science.

IV. SOVIET CONCEPTS OF BALLISTIC MISSILE DEFENSE: SYSTEMS AND OPERATIONS

Discussions of BMD in the open Soviet press have historically been cloaked in secrecy and innuendo. In assessing Soviet statements on BMD, Michael Deane in 1980 characterized Soviet military literature as reflecting an "absolute void with regard to Soviet anti-missile and anti-space weaponry." [Ref. 61:p. 50] This silence has probably been due as much to the Soviets' desire to ensure secrecy about their BMD capabilities as it is to reap the propaganda benefits of denying that these capabilities exist in the first place. For example, prior to signing the ABM Treaty the Soviets openly discussed BMD in their professional literature, even on one occasion announcing the operational range of the Galosh interceptor. After 1972, however, nearly all references to their own BMD systems disappeared from the open literature. Since the mid-1980s, however, some Soviet statements intended for Western audiences have acknowledged the Soviet interest in certain military uses of space [Ref. 62:p. 39]. The Soviets nevertheless deny any interest in obtaining BMD capabilities more extensive than those permitted by the ABM Treaty, and assert that the U.S.S.R. has no interest in developing what the Soviets term "space-strike weapons."

In order to maintain secrecy while at the same time educating their officer corps (and, to some extent, the Soviet public at large) about these sensitive military topics, Soviet authors frequently attribute such concepts and systems to "foreign" sources. As William Scott writes, "the use of alleged materials from the 'foreign press' to keep members of their armed forces informed on current weaponry and military concepts is a standard practice throughout the Soviet Armed Forces."

[Ref. 63:p. 2] The Defense Intelligence Agency observes that the "use of the qualifier 'foreign' is particularly widespread in Soviet treatment of military space issues, largely because Soviet propaganda denies any Soviet military exploitation of outer space." [Ref. 64:p. 9] Careful analysis of such "foreign" materials in the Soviet military press may therefore yield significant insights about Soviet concepts for space operations. Soviet discussions of "foreign" activities and systems may, in other words, reveal what the Soviets themselves deem important.

A. THE SOVIET CONCEPT OF NATIONAL AIR DEFENSE

As shown in the preceding chapter, Soviet military doctrine currently anticipates national air defense of the Soviet Union to be one of the three primary strategic actions of the Soviet armed forces in a future war.[6] National air defense is perceived by the Soviets to be an integrated defense against all means of an enemy air attack. According to the Soviet Military Encyclopedia, national air defense includes "the aggregate of national measures and troop combat operations carried out to defend. . . the country against destruction from the air." [Ref. 65:p. 588] The basic handbook for all Soviet air defense officers, published in 1981, defines enemy "aerospace attack forces" as including "ballistic missiles, aerodynamic and space airborne platforms, dirigibles, and balloons." [Ref. 66:p. 16] Thus, Soviet national air defense encompasses much more than defense against aircraft. As the 1963

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[6] A difficulty arises in translating the Russian phrase, *protivovozdushnaya oborona* , or "PVO." PVO can refer to both the broader Soviet concept of strategic air defense against aircraft, ballistic missiles, satellites and space weapons as well as to the more narrow concept of antiaircraft defense. For clarity, the author will use "national air defense" when referring to the broader meaning of air defense (i.e., including antimissile and antispace defense) and "antiaircraft defense" for the more restricted meaning.

edition of Military Strategy confirms, "Modern air defense is built to be antiaircraft, antimissile, and antispace united in a single system." [Ref. 17:p. 297] Further explanation of this Soviet concept is given by the 1967 *Tolkovyy Slovar' Voyennykh Terminov* (Explanatory Dictionary of Military Terminology), which states:

> Air defense (*Protivovozdushnaya Oborona*) is defense from an air enemy. It includes antiaircraft, antimissile, and antispace defense. One differentiates air defense of the country, of troops, and of naval forces. . . Air defense of the country is the totality of general-state measures and combat actions of air defense troops supporting the active shielding of vitally important regions, administrative-political and industrial centers, industrial enterprises, roads, strategic and other objects. The missions of air defense of the country are carried out by the Troops of National Air Defense. [Ref. 67:p. 347 (emphasis added)]

Thus, in the Soviet view, national air defense is accomplished by a unified military system[7] for defense of the country against enemy air threats, including traditional antiaircraft defense (including sea-based systems), BMD and antispace defense. The Soviet national air defense system can be schematically represented as shown in Figure 4.1.

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[7] As John Hines and George Kraus point out, "While Western defense planners normally apply the term "system" somewhat narrowly to a specific weapon and its ancillary equipment, Soviet military planners use the term to describe all the elements required to achieve a given objective." [Ref. 12 : p. 28]

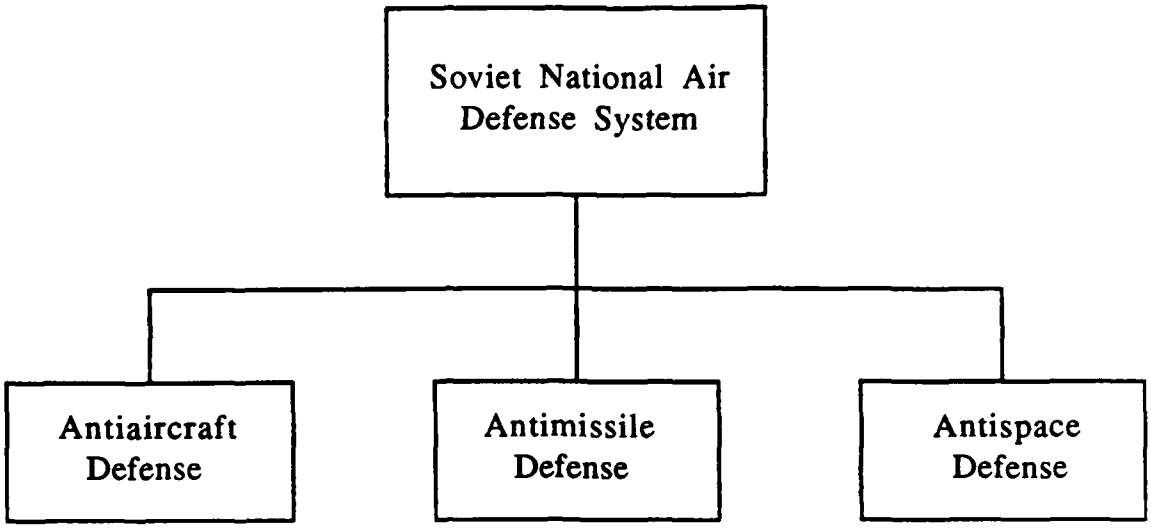

Figure 4.1 The Soviet National Air Defense System

Due to its critical importance in Soviet perceptions of a future war, national air defense "has been made an independent category of combat action" [Ref. 31:p. 474] and is carried out by an entirely separate service of the Soviet military, the Troops of Air Defense (*Voyska Protivovozdushnoy Oborony*, or V-PVO).[8] Military Strategy states that "this service of the Armed Forces [Troops of National Air Defense][9] was created for the purpose of antiair (PVO) and antimissile (PRO) defense of the country. Its mission, in conjunction with the PVO troops of the Ground Forces, is to prevent penetration by enemy means of air attack into the air

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[8] The V-PVO generally ranks number three in precedence within the Soviet armed forces, following the Strategic Rocket Forces and the Ground Forces, but ahead of the Air Forces and Navy. [Ref. 28: p. 159]

[9] In 1981 the Troops of National Air Defense (*Voyska PVO Strany*) became the Troops of Air Defense (*Voyska PVO*) as part of a general reorganization of Soviet air defense forces.

space of the country and to prevent his nuclear attacks against the most important regions and objectives of the country . . . ." [Ref. 17:p. 251] General-Major Tyushkevich wrote in 1978 that, "a vital necessity for our National Air Defense Forces was the creation of an impenetrable defense covering the country's rear installations and troop groupings." [Ref. 31:p. 474 (emphasis added)]

According to both the 1965 Dictionary of Basic Military Terms and the 1967 *Tolkovyy Slovar' Voyennykh Terminov* (Explanatory Dictionary of Military Terminology), BMD is an integral component of national air defense [Ref. 68:p.178; Ref. 69:p. 351]. Therefore, within the larger framework of national air defense of the Soviet homeland, BMD plays a major role.

B. SOVIET CONCEPTS OF BMD AND ANTIAIRCRAFT DEFENSE

It is useful to begin an analysis of Soviet BMD operational concepts with the Soviet dictionary definition of ballistic missile defense. Unlike U.S. dictionaries, Soviet military dictionaries, such as the Soviet Military Encyclopedia and the Military Encyclopedic Dictionary, are "the basic authoritative source for the meaning of Soviet military concepts." [Ref. 70:p. 9] According to the 1986 Military Encyclopedic Dictionary, ballistic missile defense (*Protivoraketnaya Oborona*) is defined as:

> A system of forces and means as well as the measures and military actions for repelling enemy nuclear missile attacks by defeating ballistic missiles or their warheads in flight. Antimissile defense consists of: means for long-range detection of ballistic missiles, antimissile complexes for various long-range actions, complexes of computer facilities, and means for the transmission of information. Depending on its mission, the PRO system may be territorial (for defense of the whole country), zonal (for defense of large areas) or objective (for defense of important administrative, industrial and military objectives). [Ref. 71:p. 598]

Furthermore, both the Dictionary of Basic Military Terms and the *Tolkovyy Slovar' Voyennykh Terminov* include the idea that electronic countermeasures may also play a major role in combating enemy ballistic missiles [Ref. 68:p. 178; Ref. 69:p. 251]. In describing a ballistic missile defense system in the 1962 and 1963 editions of Military Strategy, Marshal Sokolovskiy mentions "jamming devices to assure deflection of the missile from its intended target and, possibly, to blow it up along its trajectory" as a primary component of a BMD system [Ref. 17:p. 454]. Interestingly, description of the use of electronic countermeasures in a BMD system was omitted from the 1968 edition of Military Strategy and has since not appeared in any published Soviet definition of BMD. William F. Scott has postulated that a general tightening of Soviet security may have occurred in the early 1970s [Ref. 63:p. 23] and, as a result, Soviet definitions and descriptions of BMD published in the 1960s may be more detailed than those published afterwards. Significantly, later definitions seem in no way to contradict earlier ones, but merely treat the subject in a much more general manner.

According to these definitions, the Soviets consider BMD to be an integral part of a country's national air defense effort, in close association with antiaircraft defense. BMD consists not only of the procedures and tactics for countering ballistic missile attack (i.e., "measures and military actions"), but, as the literature clearly implies, also dedicated men and equipment (i.e., "forces and means"). Organizationally, the Soviets conceive of BMD as being composed of four major components: long range sensors, BMD fire complexes, computer facilities and means of communications.

The first component of the BMD system, long-range detection of ballistic missiles, is carried out by a branch of the Troops of Air Defense (V-PVO), the

Radio-Technical Troops [Ref. 42:p. 95]. Within the V-PVO, Radio-Technical Troops perform "the mission of continuous monitoring of the air space, radar reconnaissance of enemy aerial attack forces in flight, issuance of information about them to the command element for development of the battle plan, and support of the combat operations of the SAM troops and PVO aviation." [Ref. 66:p. 178]

The Soviets currently speak of radar, including early warning and over-the-horizon radars, as the primary sensor of a BMD system for long-range detection of ballistic missiles. General Anureyev stated in 1971 that, "early warning radars deployed on the major missile-threatening directions are considered to be the basic early warning devices." [Ref. 41:p. 119] According to a 1973 Soviet assessment, "the capabilities of radar equipment have been far from exhausted." [Ref. 42:p. 96] In addition to active radar detection, the Soviets are also interested in more "exotic" early warning sensors including those placed on ships, submarines, aircraft, satellites and "detection facilities launched by special rockets." [Ref. 72:p. 6]

Since "the identification of the warhead should occur in the middle leg of the trajectory" for successful intercept, space-based missile early warning systems play a critical role due to their ability to "observe the area of [enemy] missile bases for an extended time." [Ref. 42:pp. 65,67] Using infrared detection devices aboard a satellite pointed at the horizon, Soviet experts calculate that it would be possible to detect an ICBM shortly after it leaves the troposphere (approximately 10 to 15 kilometers in altitude) [Ref. 42:p. 57] Soviet specialists also point out the potential active defense role of these early warning satellites:

> In the future, American specialists feel it possible, in combination with a ground anti-missile system or anti-missile missiles placed on the satellite itself, to intercept ballistic missiles, the launching of which has been detected by an [early warning] satellite. Thus, the early warning system based on

[early warning] satellites in the long run is also designed for antimissile defenses. [Ref. 42:p. 58]

In addition to conventional radar and infrared systems, the following technologies are frequently discussed in the Soviet literature as having potential for long-range detection of ballistic missiles: advanced infrared systems, active radar satellites and laser radars as well as various other sensors to detect the radio frequency radiation from the jet trail of a missile's engines, the ionospheric disturbance caused by a high-speed reentry vehicle or the low frequency acoustic waves produced during missile launch. [Ref. 42:pp. 54-72]

The second major component of the BMD system is the BMD fire complex. As defined in the 1986 Military Encyclopedic Dictionary, a BMD fire complex includes:

> . . . the means for guaranteeing the annihilation of ballistic missile warheads: antimissiles; launch installations; automated systems for radar detection, discrimination and tracking of warheads and for the guidance of antimissiles; command posts with computer, control apparatus, data transmission and communications facilities. In range, BMD fire complexes are divided into long, medium and short range complexes.[Ref. 73:p. 507]

The Soviet Military Encyclopedia further clarifies the distinctive roles of the three types of BMD fire complexes. It adds that the long range complexes are designed to defeat (*porazhenie*) re-entry vehicles "until their entry into the dense layers of the atmosphere" in defense of large regions. The medium range complexes are for defense of "separate important regions" and are designed to defeat re-entry vehicles "on the final stages of their trajectory at the boundary of the dense layers of the atmosphere." Finally, the short range complexes are designed for the point defense of military objectives, such as "underground ICBM launch positions." The short range complexes are meant to destroy

(*unichtozheniya*) ballistic missile warheads "after they enter the dense layers of the atmosphere." [Ref. 74:p. 12] Of some interest, the same source also includes the idea that the BMD fire complex radar system should be "integrated", presumably meaning that terminal BMD radars should be integrated with other national radar systems.

BMD fire complexes form the heart of the current Soviet BMD system. They are most probably manned by Zenith Rocket Troops, another branch of V-PVO. These troops are tasked with "preventing enemy air strikes against the country's most important targets, as well as troop groupings." [Ref. 66:pp. 4, 244] In many respects, Soviet description of a BMD fire complex parallels that of a typical V-PVO SAM site, a detailed description of which is given in the Soviet Air Defense Officer's Handbook [Ref. 66:p. 246].

"Antimissiles" deployed at a BMD fire complex are a type of high speed surface-to-air missile, capable of velocities in excess of Mach 10, for intercepting enemy "strategic, operational-tactical and tactical missiles and their warheads." [Ref. 75:pp. 597-598] According to the Soviet definition, antimissiles can be equipped with either high explosive or nuclear warheads [Ref. 75:p. 598]. In 1971 the single shot probability of one antimissile successfully hitting an incoming warhead, according to unspecified "U.S." sources cited by General Anureyev, was reported as approximately 20-25 percent [Ref. 41:p. 110]. As was shown in the previous chapter, a 25% effective Soviet BMD system would increase the correlation of forces in the Soviet favor by a third.

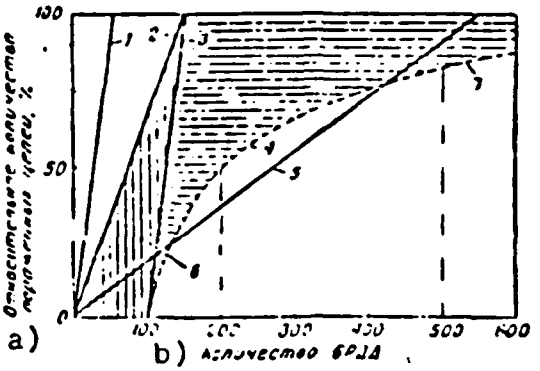
It is important to recognize that the Soviets state directly that antimissiles can be deployed at both BMD fire complexes and also at conventional V-PVO SAM sites [Ref. 75:p. 598]. Antimissiles deployed as part of a SAM site are for defense

against both "operational-tactical" (up to 300 km range) and "tactical" (up to 50 km range) ballistic missiles as well as against enemy aircraft [Ref. 76:p. 603]. In assessing purported BMD developments in the United States in the early 1970s, the Soviets observed that "mobile [BMD] systems are being created which supposedly will be able to intercept aircraft, flying bombs and tactical missiles." [Ref. 42:p. 97]

According to General Anureyev, ballistic missile interception on the terminal leg of the trajectory "has been worked on the most." [Ref. 42:p. 65] Terminal interception requires distinguishing the warheads from the decoys after they reenter the atmosphere where drag forces "filter" the lighter decoys. Since this occurs at altitudes between 70-100 kilometers, "it is essential to use high-speed [antimissiles] in order to intercept the attacking missile as far away as possible from the defended object." [Ref. 41:p. 115] Interestingly, these statements about the need for high speed antimissiles were published in 1971, long prior to deployment of the SH-08 Gazelle endoatmospheric interceptor. At that time the Soviet BMD system clearly lacked an endoatmospheric interceptor and was equipped only with the Galosh exoatmospheric interceptor. These Anureyev statements may therefore be interpreted as an indication of perceived requirements at an early phase of the decisions regarding the development of the SH-08 Gazelle.

A simple model for calculating the required number of antimissiles for various types of BMD systems was presented in General Anureyev's Antimissile and Space Defense Weapons. This model probably assumes perfect interceptor reliability and no MIRVs or decoys. However, the model was published without the usual obligatory Soviet disclaimer about it being based on "foreign" sources and may, in

a very general way, represent Soviet thinking on antimissile effectiveness. The model is shown in Figure 4.2.



1 -- ABM defenses absent; 2 -- 100 low-altitude AMM of object ABM system; 3 -- 100 high-altitude AMM of zonal ABM defense operating without considering preference principle; 4 -- 100 high-altitude AMM of zonal ABM system operating considering preference principle; 5 -- 500 low-altitude AMM of object ABM defense; 6 -- area of ABM defense operating without considering preference principle; 7 -- area of zonal ABM defense operating considering preference principle

Key:

a. Relative number of hit targets, percent

b. Number of LRBM

Figure 4.2 "Graphs for Calculating the Necessary Number of AMM [Antimissiles] With Varying Organization of ABM System" [Ref. 41:p.117]

This model was published about one year before conclusion of the ABM Treaty with the United States, which limited the Soviet Union to 100 antimissile interceptors. Interestingly, according to this model, a zonal BMD system with 100 high-altitude interceptors, such as the Moscow BMD system, which employed preferential defense tactics could successfully defend all preferentially defended

targets against 100 attacking ICBMs. Reading from the graph, the system could also provide 50% effective defense against a 200 missile attack, 20% effective defense against a 500 missile attack and, by interpolating the x-axis, roughly 10% effective defense against a 1,000 missile attack. Since the same source put the number of U.S. ICBMs at 1,054 by the end of 1970 [Ref. 41:p. 32], it might be assumed that the effectiveness of the Moscow BMD system, in the years prior to MIRVed ICBMs, can be estimated using this Soviet model.

Soviet fleet air defense is another integral component of Soviet national air defense that can also contribute to the BMD mission. Air defense of Soviet naval forces is conducted with "the antiaircraft weapons of ships and naval bases and naval fighter aviation in coordination with the National Air Defense Forces and the Ground Forces." [Ref. 77:p. 587] According to General Anureyev, "the antimissile defenses of the coastal zone and naval bases under modern conditions . . . should comprise part of the unified ABM system of the nation." For ships in port, "the antimissile defense of the ships in almost no way differs from the ABM missions carried out by the ABM forces of the nation." For ships at sea in coastal waters, "defense is also organized in close coordination with the ABM forces of the nation." Soviet naval forces can play a role in "detecting the enemy offensive aerospace weapons, and . . . repelling their strikes by antimissile weapons."[Ref. 41:p. 191]

The Soviet literature recognizes that one of the major advantages of sea-based BMD weapons is the fact that "intercepting of the [ICBM] warheads far from the defended territory will not threaten the population with radiation danger." Additionally, sea-based BMD allows for the possibility of intercepting warheads in

mid-course prior to the separation of decoys and reentry vehicles. [Ref. 41:p. 192][10]

The Soviet literature of the 1960s and early 1970s is also rich with references to future BMD weapons based on directed energy technologies. Among the specific areas mentioned as having particular promise for ballistic missile defense are lasers, pulsed or enhanced radiation weapons, radio frequency energy weapons, and high energy particle beams [Ref. 79:pp. 79-80]. According to Colonel-Engineer L. Migunov, "a high-energy laser device installed in a [satellite] is considered an effective weapon for destroying ballistic missiles in the active portion of the trajectory." [Ref. 72:p. 7]

Kinetic energy weapons and weapons using conventional warheads are also identified as having great potential for BMD because the "use of nuclear warheads for these targets [enemy warheads] is considered unadvisable since a series of nuclear explosions in space would weaken ground-based radar systems for warhead detection and tracking." [Ref. 80:pp. 80-81] A 1982 article in the journal Technology and Armaments explains:

> In order to destroy missile nose cones, it is proposed that ABMs charged with a conventional explosive as well as fragmentation components be used. It is assumed that detonation of a conventional explosive charge can be effective for destroying a long-range [ballistic missile] (in the active portion of the trajectory) as well as for destroying the nose cone of medium- and short-range ballistic missiles when the ABM is launched from a [satellite]. In the atmospheric portion of the trajectory, a nose cone can be relatively reliably

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[10] Interestingly, although General Anureyev speaks of integrating naval units into the nation's BMD system, the Soviet naval literature itself reflects no mention of "anti-ballistic missile systems or other air defense forces and systems which could counter cruise or ballistic missiles launched from sea or transiting the ocean airspace." [Ref. 78: p. 59]

destroyed as the result of mass employment of guided and unguided missiles. [Ref. 72:p. 7]

The final two components of the BMD system are its automated computer facilities and its means for information transmission. These two interrelated elements are crucial to the control of the BMD system. According to one Soviet expert, "automated information and command systems are essential for coordinating the actions of the forces and means of such a complex aerospace defense." [Ref. 41:p. 111] Unfortunately, little information on BMD technical control equipment or procedures is published in the open literature. Nevertheless, Soviet authors recognize that significant computational power is required to process sensor data and discriminate warheads from decoys, track incoming warheads, calculate missile intercept vectors and assign weapons systems for engagement. As one Soviet author puts it:

> The carrying out of this most important mission in a nuclear war is inconceivable without using modern systems of automated control over the active air defense weapons where time is measured in fractions of a second. [Ref. 42:p. 6]

By integrating the published Soviet definitions of BMD, it becomes clear that the Soviets view BMD as an integral component of their overall national air defense effort. BMD is closely connected with traditional antiaircraft defense and in many respects, the missions and means of BMD and antiaircraft defense overlap. According to General-Major M.I. Cherednichenko, faculty member at the Voroshilov General Staff Academy and contributing author of Marshal Sokolovskiy's Military Strategy, "the air defense troops consist of fighter aviation, antiaircraft missile troops, and radar troops, as well as forces and means for warning of a missile attack and monitoring outer space." [Ref. 42:p. 95 (emphasis

added)] In the Soviet military, BMD forces probably include dedicated men and equipment whose primary purpose is the destruction of enemy ballistic missiles, both what we in the West call "strategic" ballistic missiles and "tactical" ballistic missiles. Currently the primary Soviet BMD weapon is the ground-launched antimissile. However, electronic countermeasures and, in the future, directed energy and kinetic energy weapons may also play a major role in countering an enemy ballistic missile attack.

It is important to note that, according to Soviet discussions, current BMD weapons may be deployed at both BMD fire complexes and also at conventional SAM sites. Antimissiles deployed at SAM sites are truly dual-purpose weapons, able to be used against ballistic missiles as well as aircraft [Ref. 76:p. 603]. With this Soviet operational concept in mind, it would seem quite natural that the Soviet military would seek to develop and deploy a missile system, such as the SA-10 or SA-12, capable of performing in both an antimissile and antiaircraft role. This Soviet operational concept clearly states a Soviet requirement to field ATBMs and, with continuing advances in missile system technology, comes close to contradicting article VI, paragraph (a) of the ABM Treaty, in which the Soviet Union specifically pledged "not to give missiles, launchers, or radars, other than ABM interceptor missiles, ABM launchers, or ABM radars, capabilities to counter strategic ballistic missiles or their elements in flight trajectory, and not to test them in an ABM mode." The problems posed for Western security by these Soviet "strategic SAMs" will be discussed in greater detail in the following chapter.

In addition to its close ties with antiaircraft defense, BMD is also integrated with the antispace defense mission in the Soviet literature. This relationship, and

the implications it holds for the future of Soviet BMD, will be examined in the following section.

C. SOVIET CONCEPTS OF BMD AND ANTISPACE DEFENSE

Soviet BMD is closely related to antispace defense as part of the larger Soviet concept of national air defense. In the Soviet view, defense against enemy space weapons will be of critical importance in a future war. Claiming to report the views of "foreign military specialists", Soviet experts write that "airspace and outer space [are] a strategically inseparable medium above the earth's surface, where military actions will be of important significance for armed combat as a whole. According to the views of the U.S. military leaders, outer space will be a unique theater of military actions in which the same fierce combat may develop as in the air in the past." [Ref. 42:p. 55] A 1983 article in Aviation and Cosmonautics states that "in the future space will become the principal theater of military operations." [Ref. 81:p. 99 (emphasis added)] According to the Soviet Military Encyclopedia:

> Bourgeois experts regard space warfare as part of war as a whole. It may be conducted during a war, precede the unleashing of a war, or constitute the beginning of a war. Space-to-space, space-to-surface, and surface-to-space combat operations are considered possible during a space war, depending on the objectives, conditions and time. [Ref. 82:pp. 86-88]

In Soviet thinking, antispace defense is a major component of both national air defense and space warfare.[11] The 1986 Military Encyclopedic Dictionary defines antispace defense (*Protivokosmicheskaya Oborona* or PKO) as "a system of forces

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[11] The Soviets divide "space weapons" into three major categories: (1) space systems for supporting combat operations of the services of the armed forces, (2) space weapons for making attacks from outer space against enemy spacecraft and ground targets, and (3) antimissile and antispace defense weapons. [Ref. 41: p. 64] See also Ref. 42: p. 55

and means, as well as the measures and combat actions for detecting and destroying (putting out of action) space vehicles." It includes both the means for monitoring space and for destroying spacecraft. Intercepting and destroying enemy spacecraft may be carried out by "special complexes for launching automatic satellite interceptors and aiming them at enemy space vehicles, as well as by BMD fire complexes." [Ref. 83:p. 596] According to both the 1965 Dictionary of Basic Military Terms and the 1967 *Tolkovyy Slovar' Voyennykh Terminov*, antispace defense, like ballistic missile defense, is also a "component part" of national air defense [Ref. 84:p. 177; Ref. 85:pp. 348-349].

Since the launch of Sputnik I in 1957, Soviet spokesmen have asserted that all Soviet space operations are for "peaceful purposes." [Ref. 63:p. 17] In the mid-1960s the Soviet Union adopted a declaratory policy of excluding space as a possible arena of action for Soviet military forces. The Soviets have subsequently attributed attempts to militarize space to the United States. Consequently, after signing the Outer Space Treaty in 1967, Soviet authors became much more circumspect in their discussions of antispace defenses. For example, the 1968 edition of Military Strategy was selectively purged of references to the military use of space. One section entitled "Problems of Using Outer Space for Military Purposes," which in the 1962-63 editions had appeared in the chapter "Methods of Conducting Warfare," was omitted. Instead, much of the section was moved to another chapter entitled "Military Strategy of Imperialist Countries." [Ref. 63:p. 49] Furthermore, since at least 1978, Soviet military dictionaries have strictly defined both antispace defense and space warfare as "foreign" concepts [Ref. 83:p. 596; Ref. 86:p. 594]

Organizationally, Soviet BMD troops and antispace defense forces are both components of the V-PVO [Ref. 28:p. 163] and are probably under the operational control of the Soviet General Staff which directs their employment through the main staff of the V-PVO.[12] According to the Soviet Military Encyclopedia, "combat operations involving space and space defense weapons and systems . . . are conducted under the leadership of a country's highest military command." [Ref. 82:p. 86] This relationship is illustrated in Figure 4.3.

Long range detection of both ballistic missiles and space vehicles is carried out by the same branch of the V-PVO, the Radio-Technical Troops [Ref. 42:pp. 95-96]. For antispace defense as well as BMD, long range surveillance begins at launch:

> Basically the problem [of detecting space objects] is to detect the launch of the carrier rocket and track it over the active portion of its trajectory to derive preliminary data for warning and giving target data to a system for outer space control. It involves essentially the same problems faced by antimissile systems for detecting launches of combat rockets and identical means are being used for the solution. [Ref. 88:p. 97 (emphasis added)]

As noted in the preceding section, the Soviets distinguish between ballistic missile interception on the boost, mid-course and terminal phases of the missile's trajectory.[13] In the Soviet analysis, intercepting ballistic missiles in mid-course is considered quite similar to intercepting satellites in orbit [Ref. 41:p. 114]. According to one Soviet spokesman, "the technologies required by the most sophisticated antisatellite weapons systems are very much similar to those which are

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[12] There is limited evidence suggesting that Soviet manned space operations are of primary interest to the Soviet Air Forces [Ref. 63: p. 4] while the launching of space vehicles is the responsibility of the Strategic Rocket Forces [Ref. 87: p. 5].

[13] More recent Soviet writings distinguish between boost and post-boost phases of a missile's trajectory. For example, see Ref. 89: p. 18

needed to bring down ballistic missiles." [Ref. 90:p. 49] These technologies were discussed in the previous section and include enhanced radiation, laser, particle beam, radio frequency and kinetic energy weapons. The Soviets also include "radio-electronic warfare" as a defensive means "in the struggle against space weapons." [Ref. 91:pp. 74-75]

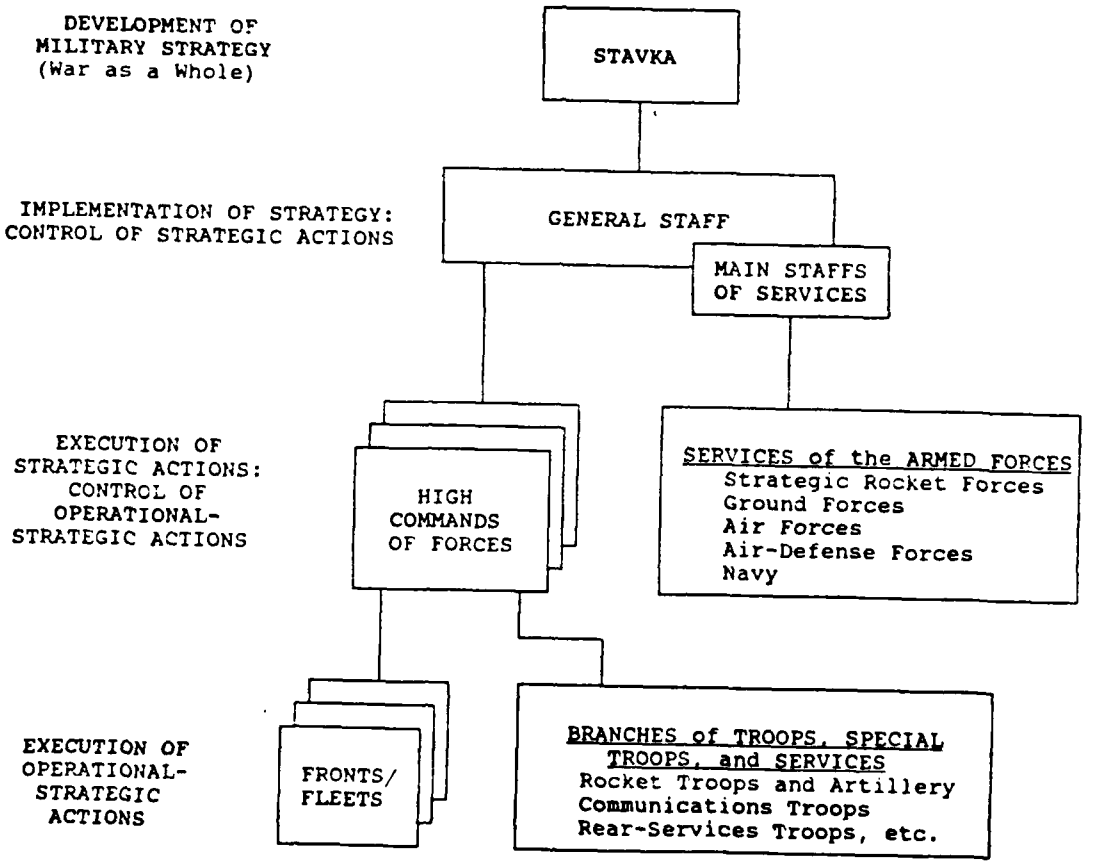


Figure 4.3 Control Structure at the Top of the Soviet Command Hierarchy [Ref. 87:p. 6]

Furthermore, the Soviets consider BMD antimissiles to be one of the primary weapons for destroying enemy satellites [Ref. 83:p. 596]. This point is significant in that the Soviet GALOSH antimissile has been operationally deployed since the late 1960s, giving the Soviets both a limited BMD capability and an operational ASAT for the last twenty years. The U.S. Department of Defense has assessed the Galosh interceptor deployed around Moscow as having "an inherent ASAT capability against low-altitude satellites." [Ref. 19:p. 52] Additionally, in publicly confirming that the Soviet Union has an ASAT capability in May 1985, General-Colonel Nikolay Chervov may have been referring to the GALOSH and not the Soviet co-orbital ASAT when he described the Soviet ASAT weapon as consisting of "land-based missiles." [Ref. 92:p. AA5]

Due to the intercept geometry, interception during the boost phase of a missile's trajectory requires space-based detection and engagement. Soviet literature since the early 1970s has been somewhat skeptical of the possibilities for boost phase intercepts, yet at the same time acutely attuned to the potentially revolutionary advantage such a capability would bring. In 1971 General Anureyev characterized mid-course and terminal defense as "the basis for setting up the ABM system." [Ref. 41:p. 115] Among the perceived drawbacks in the early 1970s of a boost phase intercept system were the requirements for "great reliability of the instrumentation", the high cost of such a system, and the susceptibility of the interceptors to electronic countermeasures. Moreover, for boost phase intercept, "the limited reaction time for the antimissile defenses excluded the possibility of rapid decision making." [Ref. 41:p. 114] This last point is interesting in that it may imply a Soviet preference for a "man in the loop" in the weapons control process, rather than a fully automatic system.

Despite this skepticism, however, Soviet commentators in the early 1970s were careful to note that "a disturbance of this [offense-defense] equilibrium of forces is considered possible in line with new scientific discoveries which will make it possible to . . . create an 'umbrella' ABM system in the form of a dependable screen over the defended territory." [Ref. 41:p. 118] Because of this possibility, "forecasting the development of science and technology and determining promising scientific directions are of urgent significance for developing the armed forces" in general and for antimissile forces in particular [Ref. 42:p. 72].

Throughout the current anti-SDI propaganda campaign, Soviet commentators are continuing to stress the technical infeasibility of space-based BMD, while at the same time urgently warning of the dire consequences should such defenses be realized. In 1983, Andrei Kokoshin of the Institute of the USA and Canada wrote that "the overwhelming majority of American specialists have doubts, from a scientific and technological point of view, about the very possibility of creating any sort of reliable defense of this type." [Ref. 93:p. 21] Just one year later, however, Kokoshin seemed to imply that fielding of such a system by the U.S. was a distinct possibility, warning that "while a space antimissile system is being developed and deployed, the means of breaking through it will be improved at an accelerated pace." [Ref. 94:p. 27] Similarly, in his 1985 interview with Time magazine, General Secretary Gorbachev himself characterized the prospects for a totally effective space-based antimissile system as "sheer fantasy." [Ref. 95:p. 24] Yet in the 1986 Weaponry in Space: The Dilemma of Security, several leading Soviet academics - Yevgeni Velikhov, Roald Sagdeev, and Andrei Kokoshin - while questioning the technical reliability and operational effectiveness of a space-based antimissile system, stressed the "enormous dangers for the stability of the strategic

balance and international security, which might come about should the United States attempt to develop and deploy a comprehensive ballistic-missile defense." [Ref. 89:p. 11]

Although certainly motivated chiefly by propaganda purposes, it is quite possible that Soviet anti-SDI commentary accurately reflects a well thought out skepticism on the part of the Soviet military regarding the effectiveness of a Soviet space-based BMD system, as well as a gnawing fear that the United States might ultimately succeed in developing and deploying just such a system. Unfortunately there exists no clear confirmation of this hypothesis in the open Soviet military literature. However, the many problems foreseen by Soviet commentators for a space-based missile defense system--the high mechanical reliability required of individual space systems, the extended on-orbit lifetimes required, the extremely high costs and complexity of servicing a constellation of BMD battle stations, the uncertain performance of such battle stations under high operational loads, and the susceptibility of these stations to countermeasures [Ref. 89:pp. 56-64]--are all areas in which the Soviet Union may see themselves at a technological disadvantage. Conversely, these are all areas in which the Soviet Union might anticipate U.S. technological advantage in the future.

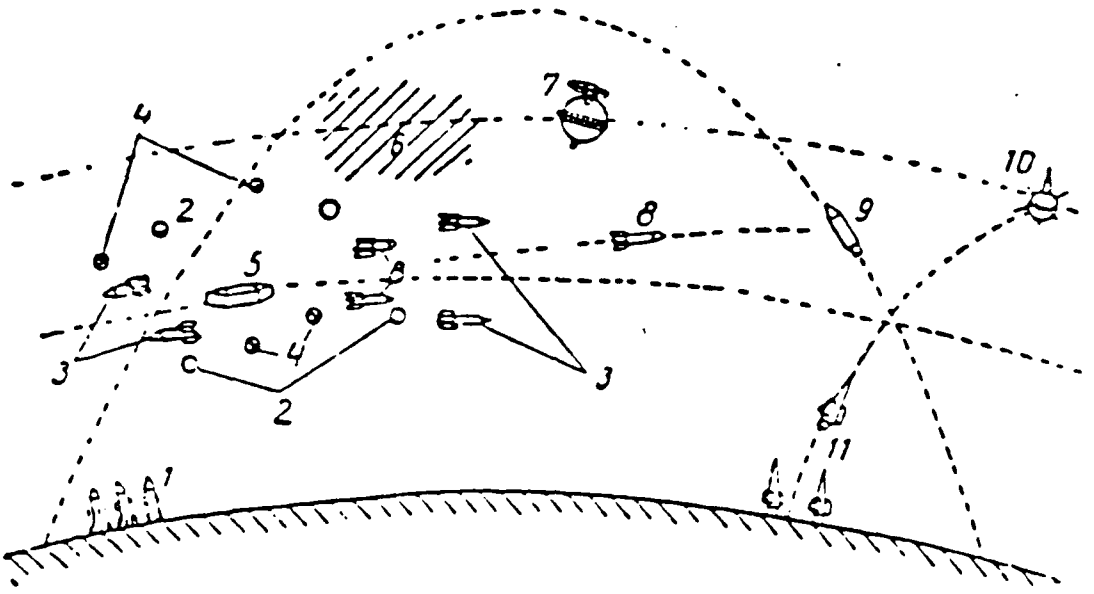
While Soviet military literature has historically been quite skeptical of the potential for effective space-based BMD, manned space platforms have nevertheless played a particularly important role in Soviet conceptualizations of space warfare and BMD, as well as in Soviet thinking about the future of armed conflict in general. According to the Soviet literature, "a manned space lab is one of the basic means for conquering space for military purposes." [Ref. 41:p. 96 (emphasis added)] As General Anureyev observes:

> It is felt that from the military viewpoint, the manned satellite opens up a completely new era. Being ultrafast and operating on a worldwide scale, the manned satellite will provide an opportunity to exercise constant military control over the world, and this control will be more accurate and more effective than the control carried out even by advanced unmanned devices. The manned spacecraft, in the opinion of American specialists, can achieve much more than the intercontinental missiles. [Ref. 41:p. 91 (emphasis added)]

Therefore, in Soviet concepts of space defense and BMD, manned "orbital space labs" play a pivotal role. Orbital labs can permit continuous observation of the earth's surface "to keep track of all missile launches" as well as serve as weapons platforms for "orbital bombing and using weapons to combat enemy spacecraft, as well as for intercepting ballistic missiles in the middle portion of their flight." [Ref. 41:pp. 96,99] The role of manned spacecraft in reconnaissance is particularly emphasized. As General Anureyev stresses, "the capability of man to observe objects in space and on the ground, as well as to analyze and assess his observations gives particular value to a spaceflight." [Ref. 41:p. 90] In further describing manned reconnaissance from space, General Anureyev adds that, "the decisive role is given to the human operator in the reconnaissance spacecraft. . . the automatic devices merely substantially facilitate the conducting the observations." [Ref. 41:p. 93] Military Strategy added that, in the view of the Americans, "it is considered possible to build military stations which can be used as command posts in space for conducting strategic reconnaissance using all types of reconnaissance equipment, to intercept satellites in orbit, and also for bombing from space." [Ref. 17:p. 88]

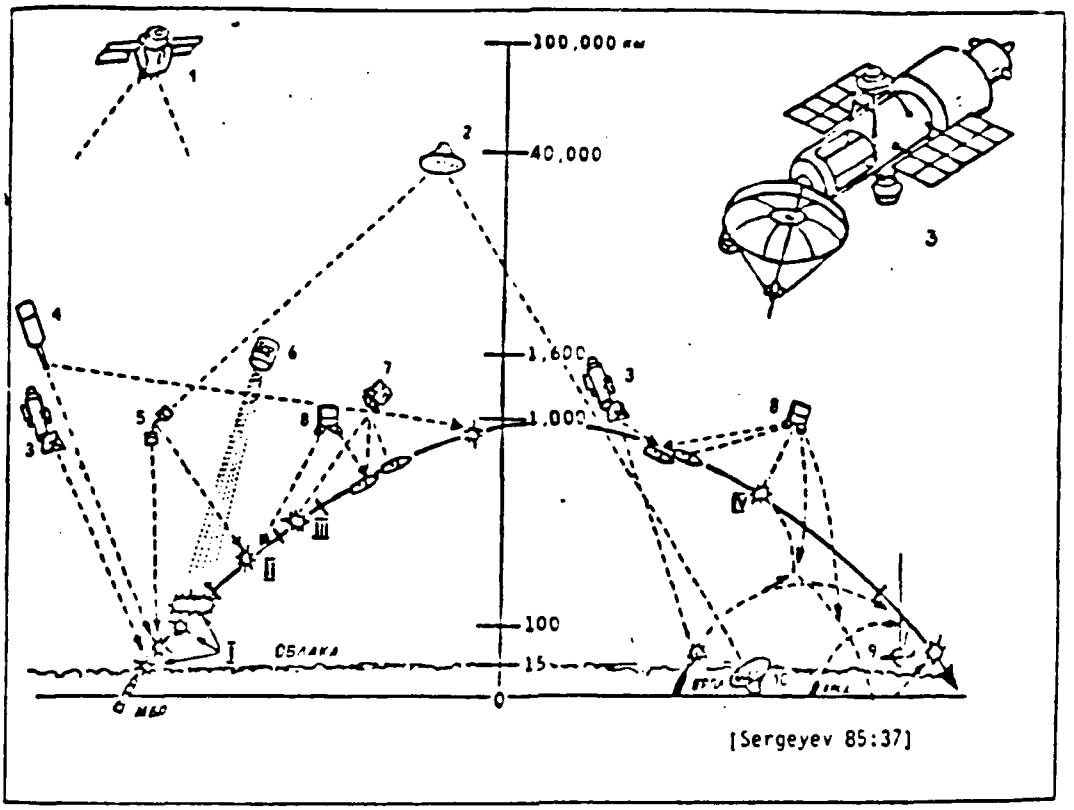
Since the mid-1960s, Soviet descriptions of BMD systems architectures have included orbital space stations as integral system components (Figure 4.4). In fact, a 1985 article in Aviation and Cosmonautics showed a modular space station,

appearing somewhat like a Soviet "Salyut" space station, which served as a platform for a chemical laser weapon (Figure 4.5).



1) antimissile defense weapons;
2) source of electronic interference;
3) missiles to intercept antimissiles;
4) decoys;
5) orbital space station;
6) barraging (patroling) zone;
7) satellite to intercept enemy satellites;
8) antimissiles;
9) long-range enemy ballistic missiles;
10) enemy satellite;
11) antispace defense weapons.

Figure 4.4 "American Specialists' Views on the Distribution of Military Spacecraft for Defensive Actions" [Ref. 96:p. 24]



Illustration

The orbital structure of a layered BMD system:
I - ICBM boost-phase intercept
II - intercept of dispensing stage and separating warheads
III-IV - mid-course warhead intercept;

1 - EW satellites
2 - "mirror" in stationary orbit
3 - orbiting station with chemical laser on board
4 - electromagnetic cannon
5 - "battle" mirror
6 - orbiting station with X-ray laser on board
7 - orbiting station with an accelerator weapon
8 - orbiting platform with target tracking and discrimination equipment
9 - target designating aircraft
10 - ground-based laser battle station

Figure 4.5 "Orbital Structure of a Layered BMD System" [Ref. 97:p. 37]

Manned orbital labs can be "equipped with instruments for carrying out the basic space operations," which include "detection, discrimination, interception, and destruction of enemy space objects." As General Anureyev wrote in 1971, "early interception of [ballistic missiles] is viewed also by using antimissiles launched

from a [manned] orbital station." [Ref. 41:p. 198] Furthermore, "the use of laser weapons is considered to be most probable on manned space interceptors and space defense labs." [Ref. 41:pp. 224,250 (emphasis added)] The Soviets also claim that the U.S. space shuttle is designed to be used as a space platform for a laser weapon [Ref. 98:pp. 30]--it is perhaps no accident that they are currently busy developing their own shuttle [Ref. 19:p. 54].

As pointed out previously, the Soviets value the presence of a "man in the loop" in the process of controlling weapons, especially aboard spacecraft. Manned spacecraft enjoy significant advantages over unmanned satellites. According to the Soviet Military Encyclopedia, "the presence of a crew on board assures the solutions of complicated logical problems and making corresponding decisions." [Ref. 99:p. 388] Furthermore, "a guided spacecraft with a crew can increase the effectiveness of space reconnaissance, it can accurately identify a target and distinguish a combat satellite from decoys, as well as simplify the execution of the mission of hitting space and ground targets, reduce the probability of accidental release of weapons, and so forth." [Ref. 41:pp. 65-66 (emphasis added)] Marshal G.V. Zimin pointed out in 1976 that the presence of man in space "will significantly simplify guidance in identifying and destroying the enemy's satellites or in capturing them." [Ref. 100:p. 81] Manned space platforms would therefore appear to play a unique and central role in any Soviet concept of advanced BMD or antispace defense.

The Soviet concept of BMD therefore is clearly an integral component of Soviet national air defense. BMD exists in close relationship with both antiaircraft defense and antispace defense, and the systems and operations of all three overlap and reinforce one another. In the Soviet mind, national air defense of the homeland

encompasses protection against a continuum of threats--from hostile aircraft to ballistic missiles to satellites and "space-strike weapons." As Marshal Zimin observed in 1976:

> The enormous destructive power of nuclear warheads raises the necessity of destroying all targets without exception, which accomplished a breakthrough into the interior of the country from air or space . . . All of these conditions put before the air defense complex and responsible tasks, the resolution of which will be determined by the ability to repulse strikes not only of aerodynamic, but also of ballistic means of attack. [Ref. 60:p. 172]

In the future, Soviet experts expect the antiaircraft, antimissile and antispace defense missions to converge into a single integrated mission. In his assessment of the future of national air defense, General Anureyev observed in 1971:

> . . . abroad it is felt that in the nuclear and space age, over the immediate future, the basic tasks remain: detection, identification, interception, and destruction. There is to be a further improvement in the weapons systems and the methods of using them. In the more distant future, air and space defenses will develop into a single global system of air and space defense. It, in the opinion of foreign specialists, should provide defense against all types of ballistic missiles (SRBM, IRBM, and LRBM) and aircraft, as well as against orbital manned systems and manned spacecraft. [Ref. 41:p. 113 (emphasis added)]

A comprehensive system of aerospace defense will greatly help to ensure the attainment of Soviet wartime objectives. As Military Strategy concludes, "without the effective conduct of these operations, successful conduct of a modern war and assurance of the normal vital activities of the country are impossible." [Ref. 17:p. 285]

V. THE OUTLOOK FOR SOVIET BALLISTIC MISSILE DEFENSE

A. SOVIET BMD AND ANTI-TACTICAL BALLISTIC MISSILES

It is clear from the discussion of Soviet BMD concepts in the previous chapter that the Soviet military makes no great distinction between strategic and tactical BMD, nor between strategic and tactical SAMs. The Soviets state quite openly that antimissiles (i.e., surface-to-air missiles capable of shooting down ballistic missiles) may be deployed at both BMD fire complexes and at traditional SAM sites. Furthermore, antimissiles deployed at SAM sites may be used for defense against both "operational-tactical" and "tactical" ballistic missiles as well as against enemy aircraft. These Soviet operational concepts are currently being realized with the fielding of the SA-10 and SA-12 missile systems, which possess substantial capabilities against a broad range of airborne targets.

The absence of a distinction between tactical and strategic air defense in Soviet conceptualizations is quite significant. In contrast to the American tendency to establish somewhat autonomous concepts of tactical and strategic weapons, Soviet thinking reflects a much more integrated and much less compartmentalized concept of defense against aerospace threats. The Soviets tend to perceive threats from the air as a continuum: from aircraft and cruise missiles, to ballistic missiles (both tactical and strategic), to weapons placed in orbit around the Earth. As General Anureyev observes, "near space is viewed as a single sphere in which it is possible to have flights of conventional aircraft, reusable manned spacecraft, artificial satellites, and other objects." [Ref. 41:p. 62]

In response to this spectrum of aerospace threats, the Soviets develop and deploy weapons systems optimized to counter the total threat. In contrast, the American approach has historically been to look at Soviet aerospace threats in isolation from their overall operational context in order to develop a weapons subsystem optimized to counter a particular Soviet weapon [Ref. 13:p. 31]. The purpose of this comparison is not to argue that the Soviet method is necessarily better than the American method, but to emphasize that it is different and should be recognized as such in assessing capabilities of individual Soviet weapons, such as the SA-10 and SA-12, as well as in future negotiations on arms limitations with the Soviet Union.

Moreover, advances in sensor technology, data handling capabilities and missile performance have done much and will continue to do much to obscure past distinctions between strategic and tactical SAMs. According to Congressional testimony by CIA officials, the SA-12's "technical capabilities bring to the forefront the problem that improving technology is blurring the distinction between air defense and ABM systems." [Ref. 101:p. 5] This convergence in capabilities has led some Western analysts to conclude that the new SA-10 and SA-12 provide the U.S.S.R. with a significant BMD capability against tactical ballistic missiles as well as an increasingly significant capability against strategic ballistic missiles that is completely outside the control of the ABM Treaty [Ref. 2:p. 215].

The U.S. Department of Defense has assessed both the SA-10 and SA-12 systems as having the capability to intercept aircraft, cruise missiles, and tactical ballistic missiles. Furthermore, the SA-10 and SA-X-12B/GIANT "may have the potential to intercept some types of strategic ballistic missiles." Over 80 SA-10 sites are currently operational in the Soviet Union and work is continuing on at

least 20 others. The majority of these sites are located in the Moscow area, leading the Defense Department to conclude that, "this emphasis on Moscow as well as the deployment patterns noted for the other SA-10 sites suggest a first priority on terminal defense of command-and-control, military, and key industrial complexes." A new mobile version of the SA-10, designated the SA-10b, "could be used to support Soviet theater forces and to permit periodic changes in the location of SA-10 sites within the USSR to counter the various kinds of U.S. retaliatory forces more effectively." The SA-X-12B, under flight testing in 1987, is an extremely capable, long range, high altitude mobile SAM that is expected to be widely deployed throughout the Soviet Union. The SA-X-12B "could, if properly supported, add a measure of point-target defense coverage for a nationwide ABM deployment." [Ref. 19:pp. 60-61]

Because the ABM Treaty only specifically limits U.S. and Soviet capabilities against "strategic" ballistic missiles, the deployment of the SA-10 and SA-12 for the ATBM role is generally accepted by the U.S. as being within the Treaty's restrictions. However, as T.K. Jones, Deputy Under Secretary of Defense for Strategic and Theater Nuclear Forces, pointed out in 1983, "at the margin, a system that has good capability against something like the Pershing II would also have reasonable capability to defend reasonable areas against our ICBMs and submarine-launched ballistic missiles." [Ref. 102:p. 242] Over both the near term and long term, one can reasonably expect this trend towards ATBM (and even strategic BMD) capabilities in Soviet air defense weapons to continue. As pointed out in Chapter 2, the improvement of air defense weapons represents a distinct development line for Soviet BMD hardware. In the meantime, the Soviets have shown little willingness to address U.S. concerns about the strategic role of SAMs

in arms control forums and, in fact, continue to maintain that none of their SAMs has any ATBM or strategic BMD capability whatsoever. What will the continued Soviet development and deployment of these strategic SAMs mean for Western security?

According to Sayre Stevens, former CIA Deputy Director for Intelligence, the development of Soviet SAMs capable of intercepting strategic ballistic missiles represents "the most disturbing change in the balance of U.S. and Soviet strategic defenses." [Ref. 2:pp. 214-215] The Soviet SA-10 and SA-12 could currently be somewhat effective against older submarine launched ballistic missiles (SLBMs), such as the Poseidon and Trident I, whose reentry vehicles generally have a larger radar cross section and whose reentry speeds are generally slower than ICBMs [Ref. 2:p. 216]. As Stephen Weiner points out, "Since a long-range [tactical ballistic missile] trajectory is virtually identical to a short-range SLBM trajectory, an ATBM system would, almost by necessity, be capable of countering SLBMs." [Ref. 103:p. 73]

This capability against U.S. SLBMs is particularly significant in that SLBMs represent the most survivable leg of the U.S. strategic triad. SLBMs constitute the majority of U.S. nuclear warheads and while at sea are not subject to Soviet counterforce strikes. In the absence of a comparable U.S. ability, a Soviet ability to counter SLBMs which is not restrained by the ABM Treaty creates a serious and widening strategic asymmetry. In the not too distant future, this asymmetry could begin to undermine the credibility and effectiveness of U.S. nuclear retaliatory capabilities, with serious consequences for the overall U.S.-Soviet strategic balance.

In the future, the Soviets may seek to develop and deploy ground-based laser weapons for use in the ATBM/BMD role. The U.S. Department of Defense has reported that the Soviets currently have ground-based lasers capable of attacking U.S. satellites and could deploy a ground-based laser for air defense in the early 1990s. An operational ground-based laser weapon for BMD could follow in the late 1990s. [Ref. 19:p. 51] In a 1985 article in *Pravda*, the Chief of the Soviet General Staff appears to justify potential Soviet development and testing of ground-based lasers. In citing Agreed Statement D of the ABM Treaty, Marshal Akhromeyev asserts that "research, development and testing of ABM systems or their components, based on other physical principles, is allowed in areas strictly limited by the treaty and clearly defined by it, and only on (in connection with) fixed ground-based ABM systems (as they are defined in Article 3 of the treaty)." [Ref. 104:p. AA1-AA7] He goes on to say, however, that deployment of such a weapon could occur only after reaching further agreements with the United States. Nevertheless, public justification of the research, development and testing of ground-based laser weapons by the Soviet Chief of the General Staff may suggest that the Soviets are not ruling out replacing elements of the Moscow BMD system with ground-based lasers at some point in the future [Ref. 9:p. 347].

B. SOVIET BMD AND THE MILITARY USE OF SPACE

Almost since the dawn of the space era, Soviet military literature has revealed a profound appreciation for the potential role of space in future warfare. In 1962, Military Strategy warned that space could become "the strategic theater of tomorrow." [Ref. 17:p. 85] General Anureyev stated in 1971 that, "any war that could start after 1975 without fail will be accompanied by military operations in outer space and in near space." [Ref. 41:p. 62] A 1980 article in Red Star, quoting

the American press, stated in no uncertain terms that, "Whoever can seize control of space -- that main arena of future wars -- will be able to change the correlation of forces so decisively that it will be tantamount to establishing world supremacy." [Ref. 105:p. 3]

Given this Soviet appreciation for the potential military role of space, President Reagan's announcement of the Strategic Defense Initiative (SDI) on March 23, 1983 must have come as a rather unwelcome surprise to the Soviet leadership. Not only has SDI signaled a renewed U.S. interest in BMD, but also, in the Soviet perception, a U.S. rejection of the current international strategic balance and a desire to regain strategic superiority by establishing a war-winning posture through the deployment of space-based weapons. In the words of Benjamin Lambeth and Kevin Lewis, "Insofar as SDI aims . . . to render nuclear weapons 'impotent and obsolete,' it threatens -- at least from the Kremlin's vantage point -- to render worthless the very basis of the U.S.S.R.'s superpower status." [Ref. 106:p. vi] It should therefore come as no surprise to the U.S. that the Soviets, faced with what they perceive as such a tremendous threat to their security, would respond to SDI in a most aggressive manner. To date, this response has included vigorous efforts to politically neutralize SDI through arms control and propaganda. In the future, Soviet responses could include: an increase in offensive arms (particularly cruise missiles) not susceptible to space-based BMD systems; countermeasures against directed energy weapons, such as fast-burning boosters, spinning boosters, and space mines or ASATs to cripple space-based weapons platforms; and the accelerated deployment of further terminal BMD weapons [Ref. 107].

But what is the likelihood of an "emulatory" Soviet response to SDI? It is clear from the discussion of Soviet BMD and antispace defense concepts in Chapter 4 that the Soviet open literature has historically revealed some skepticism regarding the effectiveness of space-based BMD. Nevertheless, because of the advantageous intercept geometry, BMD systems in space could destroy ICBMs in the boost and post-boost phases, prior to the separation of RVs and penetration aids. Intercepting ICBMs early in their flight could thus bring great strategic leverage, especially against a MIRVed ICBM threat. Would the U.S.S.R. therefore respond in kind to a U.S. deployment of BMD weapons in space? The Soviet literature is especially mute on the subject of Soviet weapons in space. However, Stephen Meyer postulates that:

> . . . there are indications from past behaviour and contemporary statements which suggest that Soviet military and political leaders do not see SDI as simply another military challenge or another spiral in the continuing nuclear arms competition where off-setting measures would suffice. Rather, SDI is seen as a profound technological challenge: the initiation of 'a new type of arms race', one involving 'previously unknown new types of weapons based on new physical principles.' This technological challenge, Soviet political and military leaders have repeatedly observed, is one which the Soviet Union cannot afford to ignore. In other words, an off-setting response to SDI is not sufficient; an emulating response is required as well. [Ref. 57:p. 275]

Most analysts agree that future Soviet initiatives in BMD weapons would stress ground-based, and not space-based, components. [Ref. 106:pp. 88-89, Ref. 108:p. 46] However, as we have seen, the Soviets are acutely aware of the importance of the new "high ground" of space in a future conflict with the West. According to John Hines and George Kraus, the Soviet leadership is "necessarily convinced that in the long term the continued struggle for military domination of space is a historical inevitability." [Ref. 13:p. 28] Yet any Soviet response to SDI involving space-based weaponry would of necessity be constrained by three major factors --

technology, economics and Soviet military thinking. Therefore, any future Soviet space-based BMD system would most likely be a uniquely Soviet response, necessarily bearing little or no resemblance to an analogous U.S. system.

1. Soviet Technology for BMD

In certain key areas for space-based BMD, Soviet technology is perhaps equal to or ahead of U.S. technology, particularly with respect to direct applications. According to the U.S. Department of Defense, the U.S.S.R. began its comprehensive research program into advanced BMD technologies in the late 1960s. Since then, directed energy physics has been an area of notable Soviet achievement. The Soviet laser program is estimated to be "considerably larger than U.S. efforts and involves over 10,000 scientists and engineers as well as more than a half-dozen major research and development facilities and test ranges." [Ref. 19:p. 50] According to one Western expert, "There are practically no areas of laser technology where the USSR has not either been at the forefront of developments, or even leading the way." [Ref. 109:p. 77] The Defense Department estimates that the U.S. and U.S.S.R. currently enjoy approximate overall equality in directed energy technology [Ref. 4:p. 245].

The Soviet laser weapons program, for which much of the research takes place at the Sary Shagan Missile Test Center, includes research in gas-dynamic, electric discharge and chemical lasers. Additionally, the Soviets are exploring the military potential of excimer, free-electron, x-ray and argon-ion lasers. This extensive research effort has given the Soviets the potential to deploy a high-energy laser weapon for troop air defense in the early 1990s and for naval air defense in the mid-1990s. Current Soviet ground-based lasers possess "some capability" to attack U.S. satellites and deployment of a prototype space-based laser weapon for

antispace defense is projected for before the end of the decade. Furthermore, the Soviets could possibly deploy an operational ground-based laser for BMD as early as the late 1990s and a space-based BMD laser weapon sometime "after the year 2000." [Ref. 19:pp. 50-51]

Particle beam and radio-frequency (RF) weapons are other promising areas of Soviet directed energy weapons research. It is estimated that the Soviet Union has "extensive programs (in progress over the past ten years and more) for the development of charged particle beam weapons, which greatly exceed the programs of the U.S.A. in both scope and state of development." [Ref. 109:p. 70] The Department of Defense concludes that the Soviets "may be able to test a prototype space-based particle beam weapon intended to disrupt the electronics of satellites in the 1990s." The development of an effective particle beam weapon for BMD, however, would take significantly longer. The Soviets have also conducted research in high power RF signal generators which potentially have both BMD and antispace applications. They could conceivably test a ground-based RF weapon for antispace defense sometime in the 1990s. [Ref. 19:p. 51]

The Soviets also have extensive research programs underway in kinetic energy weapons. They have demonstrated an experimental kinetic accelerator capable of accelerating small particles to velocities approaching 25 kilometers per second within the atmosphere and 60 kilometers per second in a vacuum. In the near future, they could possibly deploy a short-range kinetic energy weapon in space for space station defense or antisatellite attacks. A long-range kinetic energy weapon for BMD could possibly be developed in the mid-1990s. [Ref. 19:p. 51]

The Soviets currently enjoy significant advantages over the U.S. in space transportation capabilities. They maintain a large inventory of space launch

vehicles (SLVs), including eight operational boosters and the new heavy lift SL-X-17 "Energiya" which will be able to place payloads of 100,000 kilograms into low Earth orbit.[14] The SL-X-17 will be the launch vehicle for the new Soviet space shuttle, which is expected to make its maiden flight sometime in 1988. The Soviets are also developing a small, manned space plane, a subscale version of which has already been flight tested in orbit. This space plane could be used for "quick-reaction, real-time reconnaissance missions, satellite repairs and maintenance, crew transport, space station defense, satellite inspection and, if necessary, satellite negation." With this robust inventory of reliable SLVs, the Soviets routinely conduct about 100 launches per year. Many of these launches are required because of the shorter operational lifetimes of Soviet spacecraft. However, the capability to quickly launch a wide range of boosters with various payloads could give the U.S.S.R. a distinct advantage in rapidly augmenting or replacing space systems during a crisis. [Ref. 110:pp. 6-14]

The Soviets can also boast a significant advantage over the United States in manned space operations. Manned space operations occupy a central position in the Soviet space program. The Soviets have adeptly used manned space missions for political purposes, recently hosting foreign cosmonauts aboard the new "Mir" space station. Additionally, Mir cosmonauts conduct experiments in remote sensing, oceanography, meteorology and other scientific disciplines. The Soviets have maintained a permanent manned presence aboard Mir since February 1987 and cosmonaut Yuri Romanenko recently set a new space endurance record after

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[14] By comparison, the U.S. Space Shuttle can put a maximum of 26,000 kilograms into low Earth orbit (approximately 185 kilometers altitude).

326 days in space. The Soviets are also well aware of the military utility of a manned system in orbit. As noted in Chapter 4, manned space systems are central to Soviet thinking about space warfare and antispace defense.

In certain other technologies critical to a space-based BMD system, however, the Soviet Union is at a distinct disadvantage. According to the Office of Technology Assessment of the U.S. Congress, "The United States clearly remains ahead of the Soviet Union in key areas required for advanced BMD systems, including sensors, signal processing, optics, microelectronics, computers and software." [Ref. 111:pp. 11-12] Soviet efforts to catch up with the United States in these areas will involve substantial modernization of the Soviet economy.

2. Soviet Economic Constraints

Soviet leaders have accused the United States of wanting to use SDI to "exhaust the Soviet Union economically". [Ref. 112:p. A12] After more than twenty years of sustained force modernization, the Soviet leadership is finally having to confront real limits to continued military growth, owing to the serious structural problems in the Soviet economy. The problems of declining productivity, low capital investment, shortages in energy and raw materials, transportation bottlenecks and the slow integration of modern technology into the Soviet system have continued to grow since the mid-1970s. [Ref. 106:pp. 74-75]

In order to solve these problems, General Secretary Gorbachev has called for greater emphasis on the Soviet machine-building industry, particularly those sectors concerned with electronic engineering, machine tools, computers and instrumentation. However, any major Soviet effort to develop and deploy an "emulatory" space-based BMD system using Soviet "high technology" could face

significant competition for resources from the civilian sector as well as from other programs within the military. [Ref. 106:pp. 74-75]

This potential for resource competition goes to the heart of what some Western observers suspect to be an internal Soviet debate about the pace at which emerging military technologies should be pursued. According to David Yost, "The Soviets have, it appears, been debating for several years the pace at which they should attempt to introduce new non-nuclear weapons such as long-range high-accuracy delivery systems" as well as how to prepare for the introduction of weapons based on new physical principles. While there is probably little disagreement in the Soviet Union about the ultimate desirability of developing these new technologies, there may be some significant differences about the immediate military tradeoffs to be made in carrying their development forward. "The ultimate choice" for the Soviets may be "between (a) spending more now for greater military power in the near term and (b) re-capitalizing the industrial sector to be able to develop military power more effectively in the future." [Ref. 9:p. 326]

3. The Influence of Soviet Military Science

If the Soviets were to deploy a space-based BMD system in the near future, its character and scope would be strongly influenced not only by the available technology and the economic assets committed, but also by the Soviet operational concepts of BMD as worked out by Soviet military science. These concepts, as shown in Chapter 4, place great emphasis on the potential wartime role of manned space platforms. It can be expected, therefore, that any Soviet BMD systems deployed in space would, at least initially, involve manned spacecraft.

Manned space systems would overcome many of the Soviet technological disadvantages outlined above. A manned BMD battle station would not require the

sophisticated sensors, optics and automation that an unmanned station would, nor would it necessarily require the high mechanical reliability and extended on-orbit lifetimes of a network of autonomous spacecraft. More significantly, in the Soviet view, a space-based BMD system using manned spacecraft would not need to be totally leak-proof to be effective. As we have seen, Soviet strategic defenses confront a potential adversary with a broad range of obstacles to a successful strategic attack -- BMD, air defense, civil defense, mobile ICBMs, etc. -- and rely on the synergistic effects achieved by combining these partially effective components into a much more effective whole. The current Soviet lead in manned space operations and space transportation capabilities would allow the U.S.S.R., should it so choose, to rapidly deploy a space-based BMD weapon of some effectiveness using existing spacecraft, such as the Salyut and Mir.

As General Anureyev observed in 1971, "the use of laser weapons is considered to be most probable on manned space interceptors and space defense labs." [Ref. 41:p. 250] More recently, in addresssing the issue of space-based BMD weapons research and development, Roald Sagdeyev, a prominent member of the U.S.S.R. Academy of Sciences, stated that "some tests could be carried out in space," because "we scientists consider manned space stations as orbital laboratories." [Ref. 113:p. A4] The Mir space station would be particularly suited for rapid expansion into a space-based laser weapons platform. The Mir core vehicle itself is basically a habitation and flight control center equipped with six docking ports -- one rear axial port, one forward axial port and four forward lateral ports (see Figure 5.1). These docking ports can accommodate special space station modules, such as the "Kvant" astrophysics module. In the future, special reconnaissance or weapons modules could also be attached. As pointed out by the

Defense Department, some of the current cosmonaut activities aboard Mir have potential laser weapons application. For example, precise astronomical observations "can develop techniques useful for maintaining the orientation of certain equipment to an accuracy of a few arc-seconds, a capability needed to aim directed-energy weapons." [Ref. 110:p. 9] Furthermore:

> The Soviets have reported that their cosmonauts have used visual observations, cameras, spectrometers, and multispectral electro-optical sensors in their observations from SALYUT and MIR space stations. These experiments suggest the Soviets are evaluating their ability to locate, identify, and track targets from outer space. This could be the first step toward designing a space weapons platform for use against targets in space and on Earth. Such a platform may eventually be used for ASAT and ballistic missile defense operations as well as for space station defense. [Ref. 110:p. 9]

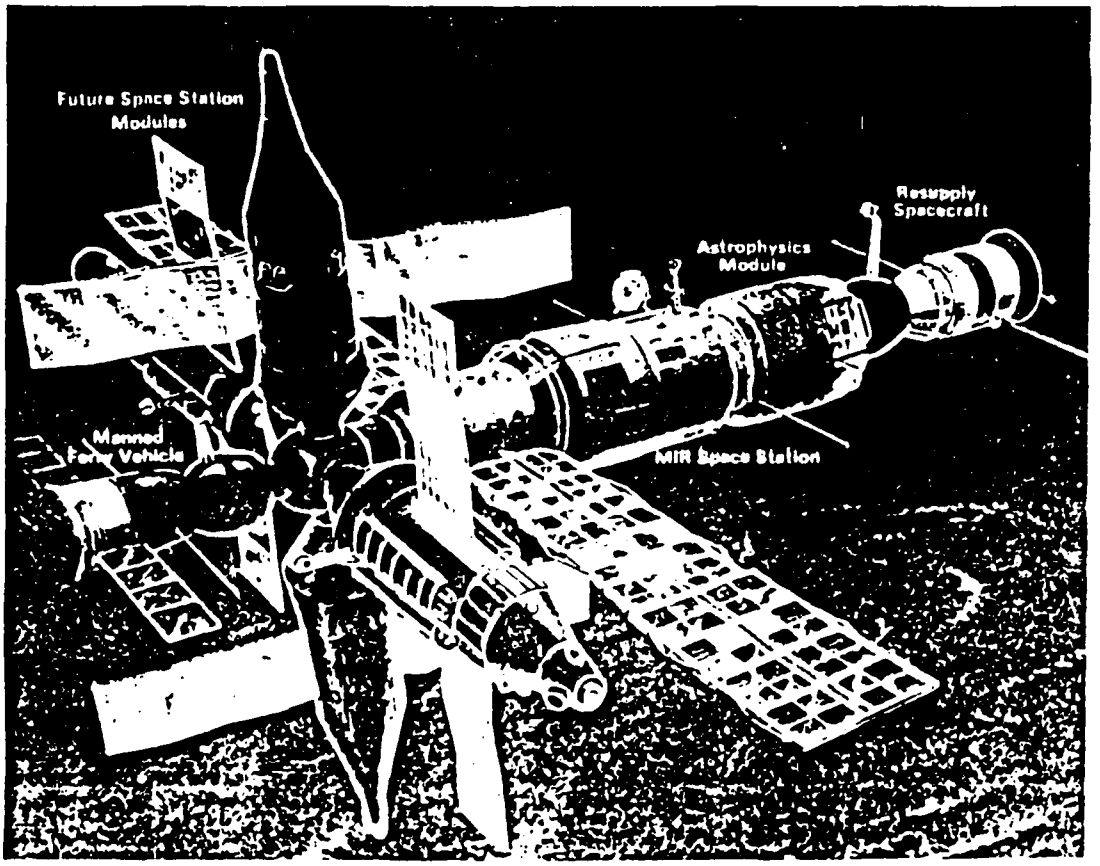

Figure 5.1 The Soviet MIR Space Station [Ref. 110:p. 10]

Soviet deployment of a space-based laser weapon for BMD would, of course, be a flagrant violation of the ABM Treaty. Such a clear-cut Soviet decision to "breakout" of the ABM Treaty could unleash a determined U.S. effort to overcome such a system; for this reason, such a breakout is considered by most Western analysts to be highly unlikely in the foreseeable future. However, the capability to deploy such a weapon relatively quickly at a time of their choosing would give the Soviet military leadership a unique treaty "breakout" potential. The question of future Soviet compliance with the ABM Treaty, as well as both the significant benefits and constraints the treaty regime has placed on the Soviet BMD program, is the subject of the following section.

C. SOVIET BMD AND THE FUTURE OF THE ABM TREATY

All in all, the ABM Treaty has done little to prevent the Soviet Union from developing the potential to rapidly deploy a nationwide BMD system. At the same time it has historically done much to delay and even halt BMD programs in the United States, such as the SAM-D program in the 1970s. With the current Soviet lead in deployed and readily-deployable BMD systems, one might wonder if at some point the Soviets may no longer find adherence to the ABM Treaty to be in their best interests. In fact, the treaty allows either side to withdraw with six months' notice in the event that its "supreme interests" have been jeopardized. Would the Soviets find it in their "supreme interests" in the near future to withdraw from the ABM Treaty?

Near term "breakout" of the ABM Treaty would certainly bring the Soviet leadership short term strategic gains. Perhaps the most important of these would be a sudden shift in the strategic balance which would weaken the credibility of Western deterrents and bring the Soviet Union great strategic and political

leverage. As the Soviets must indeed recognize, however, these gains would probably provoke a determined Western response and would probably, therefore, in the long run be counter-productive.

As we have seen, one of the primary objectives of Soviet military doctrine is maintaining a damage-limiting preemptive capability. The ABM Treaty has proven over the years to be a most effective instrument for ensuring this capability. As the Soviets admit, arms control negotiations are an integral part of their military strategy [Ref. 63:p. 5] Soviet abrogation of the treaty would remove its constraints on active Western BMD defenses and probably bring about the accelerated development of both offensive and defensive capabilities in the West. As William Odom observes:

> The deployment of active defenses for NATO, in the Soviet planner's mind, would presage many other things. First, it would be seen as the beginning of defense improvements that would lead to others, more effective, more troublesome. Second, it would reflect a different Western psychological attitude to modern warfare. The concept of mutual vulnerability, upon which Soviet negotiatiors and planners have traded without accepting for their own planning, could no longer be expected to constrain Western force development. That would be a dramatic change for both political and military leaders in the Soviet Union. [Ref. 114:p. 173]

It would seem then that the same factors are influencing the Soviet decision on ABM Treaty abrogation as influenced their decision to approve the ABM Treaty in the first place. The Soviets probably still desire to keep a rein on U.S. BMD programs in order to maintain their ability to carry out damage-limiting preemptive strikes. In fact, the Soviets will probably be content to maintain the ABM Treaty regime for the foreseeable future, not only because of the cap it puts on U.S. BMD programs, but also because of their success in strengthening their own BMD potential while generally staying within the treaty's restrictions.

Therefore, despite the impressive Soviet breakout potential, "a clear-cut decision for breakout seems improbable in normal peacetime conditions."[15] [Ref. 9:p. 314]

What is of greater concern than breakout, however, is what many analysts have termed "creepout." "Creepout" refers to the gradual circumvention of treaty responsibilities through incremental or ambiguous treaty violations and technology advances in systems otherwise permitted by the treaty. In this context, the Krasnoyarsk radar, the development of transportable system components and the testing of SAM components in an ABM mode (all identified by the U.S. government as outright or probable violations of the ABM Treaty), can be seen as part of an apparent Soviet effort to "creepout" of its ABM Treaty obligations. David Yost has concluded that, "Soviet policy has been calculated to develop as much 'breakout' potential as possible and perhaps even to 'creepout' to some extent (via SAM upgrades, among other activities) so long as this may be done without provoking the U.S. and its allies into a vigorous BMD competition and/or the pursuit of substantial offensive force countermeasures. The Soviets may see it as a sensible objective to enhance their lead over the United States in promptly exploitable BMD capabilities without endangering U.S. compliance with the ABM Treaty by engaging in violations or ambiguous activities that the U.S. would find intolerable." [Ref. 9:p. 322] William Odom has added that "creepout is probably a much greater threat on the Soviet side than breakout from the ABM Treaty." [Ref. 114:p. 164]

Another major factor which may influence future Soviet BMD developments is the U.S. SDI program. Moscow's response to U.S. BMD deployments will hold

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[15] On the other hand, if the Soviets thought war were imminent, a breakout and rapid deployment of BMD weapons could greatly improve the survivability of critical Soviet leadership and control facilities.

great risks and challenges for U.S. policy makers. Restrictions on SDI will undoubtedly be linked to any major arms control concessions the Soviets may offer. Should Soviet arms control efforts fail to stop the development of a U.S. space-based BMD system, a proliferation of Soviet offensive arms, including non-ballistic weapons, countermeasures against directed energy and kinetic energy weapons, and the rapid deployment of ground-based terminal BMD weapons can be expected. According to Chief of the General Staff Marshal Akhromeyev, "[The Soviet Union] is left with no choice: it will be forced to ensure the restoration of the strategic balance, and to build up its own strategic offensive forces, supplementing them with means of defense." [Ref. 115:p. 40]

In the long run, however, the SDI program represents a basic shift in the long-term nature of military competition with the West which the Soviets would prefer to avoid or at least delay. While current Soviet assessments of the East-West correlation of forces seem to be somewhat optimistic, long term forecasts of the military balance beyond the mid-1990s are much more pessimistic about the Soviet Union's ability to compete with the West. [Ref. 26:p. 24] This pessimism stems not only from Soviet concern about the U.S.S.R.'s economic stagnation and unfavorable demographic trends, but also from a belief that "a new qualitative leap in the development of military affairs in general is imminent.":

> In particular, the Soviet military seems to fear that the nature of military competition between the Soviet Union and the West is rapidly shifting to an increasing emphasis on the qualitative dimension. The Soviets have recognized Western efforts to bring about such a shift for at least 10 years or longer, but it has only been with the recent acceleration of the pace of the scientific-technical revolution that the Soviets have become concerned that the West might achieve this goal. [Ref. 26:pp. 24-25]

Once again the ABM Treaty could serve the Soviet Union as an effective instrument for hindering U.S. efforts to capitalize on American technological advantages while ensuring a viable Soviet counter-force capability. Concurrently the Soviets could continue to develop their own science and technology -- on the one hand, strengthening their capabilities in areas in which they enjoy an advantage, such as manned space systems and space launch assets, while on the other hand, attempting to avoid being left behind in the fields of signal processing, optics, microelectronics and computer technology -- all critical to a boost-phase BMD system and, in their view, to future warfare in general.

The Soviets would therefore probably prefer to maintain the ABM Treaty in its current form as a constraint on U.S. BMD advances, or even to strengthen it with additional constraints on so-called "space-strike weapons." Recent Soviet arms control initiatives, such as the draft treaty submitted to the United Nations in August 1983, seek to prohibit the deployment of space-based weapons regardless of the location of their targets (i.e., targets in space, in the atmosphere or on the earth's surface) and to outlaw all antisatellite weapons, interference with other nations' satellites, and space-based systems used "in any other manner as means to destroy any targets on the Earth, in the atmosphere or in outer space." [Ref. 5:pp. 53-55] Soviet concern about "space-strike weapons" has certainly intensified since the Marsh 1983 initiation of SDI, yet this Soviet concern predates SDI itself and encompasses what the Soviets now consider a central element of future theater warfare -- the "reconnaissance-strike complex." A reconnaissance-strike complex will link space-based sensors and fire systems in real time to execute strike missions throughout the depths of an enemy's defenses [Ref. 45:p. 35] In Soviet eyes, SDI is particularly worrisome, not only as a potentially effective BMD system, but also

because of the possible technological breakthroughs SDI research will foster in the fields of sensors, information processing and directed energy weapons, all of which may have direct application to future theater warfare.

Furthermore, Soviet arms control proposals to ban "space-strike weapons" have been carefully ambiguous in areas of potential Soviet advantage. According to an analysis by Steven Haas and Scott Bennett, Soviet proposals are worded so as to limit restrictions on weapons not specifically banned by the ABM Treaty. For example, according to the aforementioned1983 Soviet draft treaty, ground-based BMD weapons, including ground-based laser BMD weapons, in which the Soviets have invested great time and effort, would not be restricted.(Ref. 116: Appendix D) The U.S. Department of Defense has estimated that the Soviets could field prototype ground-based laser weapons for BMD "by the late 1980s and could begin testing components for a large-scale deployment system in the early 1990s." [Ref. 19:p. 51] As Haas and Bennett point out:

> However, if the Soviets propose less than a complete ban on ground-based weapons utilizing new technologies to attack incoming RVs, then they open the question of [using] such weapons to attack satellites. An ABM system utilizing ground-based lasers may be equally, perhaps even more, effective against orbiting satellites. Also, the treatment of direct-ascent weapons with the potential for dual capabilities to attack both satellites and incoming RVs would be uncertain. [Ref. 116]

As we have seen in Chapter 4, the Soviets believe that "the destruction of the [ballistic] missile on the middle leg of the trajectory is possible approximately with the same principles as the interception of the satellite in orbit with the missile defense weapons." [Ref. 42:p. 65] Therefore, in both the currently deployed GALOSH interceptor and in future ground-based laser weapons, the Soviets effectively have both a BMD interceptor and an antisatellite weapon. Perhaps not

surprisingly, Soviet proposals to limit "space-strike weapons" in no way appear designed to effect deployment of these weapons.

In summary, while in the mid-1970s the United States decided against BMD deployments of any type under the ABM Treaty regime, the Soviets have been able to build and modernize a BMD system of some effectiveness for preferential defense of critical leadership and military targets against small or third-party attacks. At the same time they have postured themselves for a rapid breakout from the treaty constraints, should the need arise, by gradually creeping out of the treaty through SAM upgrades, LPAR deployments, etc. This great asymmetry in BMD posture, combined with even greater asymmetries in air defenses and passive defenses, has been much to the Soviet Union's advantage over the last two decades. With the current renewed U.S. commitment to BMD, it remains to be seen whether this strategic asymmetry will survive.

VI. CONCLUSIONS

Soviet thinking on defense against ballistic missile attack is fundamentally different from that in the West. According to Soviet military doctrine, strategic defense against an enemy's nuclear attack would be one of the major strategic actions of the Soviet armed forces in a future war. Strategic air defense of the Soviet Union, particularly BMD, would therefore play a crucial role in the overall Soviet warfighting effort. As one leading Soviet military writer explained in 1976, "now victory or defeat in war has become dependent on how much the state is in a position to reliably defend the important objects on its territory from the destruction of strikes from air or space." [Ref. 60:p. 127]

Since achieving nuclear parity with the West, the Soviets have never resigned themselves to the American concept of "mutual assured destruction", but instead have attempted to arm themselves for conducting and surviving a nuclear war. A key element in Soviet nuclear warfighting strategy is damage limitation. One of the major operating principles of this Soviet strategy is the necessity for preempting an enemy's nuclear attack in order to limit damage to the Soviet Union itself. Another major principle of this strategy is active and passive defenses against an enemy's strategic attack. Therefore, for the Soviets to prevail in the event of war, while at the same time preserving the Soviet Union as a viable society and the enhancing its prospects for emerging as the dominant power in the post-war world, strategic defense against ballistic missile attack has become essential.

Within the context of this preemptive strategy, the primary role of Soviet strategic defenses might therefore be to limit damage caused by "the forces remaining to the United States after a preemptive strike." In fact, "such a mission could

significantly reduce the technical requirements put upon a BMD system. BMD does not have to carry the brunt of thwarting an enemy attack." [Ref. 2:p. 187] Even an imperfect Soviet BMD system, such as exists today, could therefore play a critical role in ensuring the survival of the Soviet Union as a political system, a functioning society and a post-war military power. In addition, such an imperfect system could be particularly effective against a limited strategic attack.

In the Soviet view, strategic offense and strategic defense exist in a close synergistic relationship. Soviet strategic defense efforts occur not in opposition to strategic offense, but in parallel with the Soviet requirement for maintaining, if possible, overwhelming military capabilities in relation to the U.S.S.R.'s likely adversaries in war. As one prominent Soviet expert on BMD wrote in 1967, "a sharp change in the correlation of forces to one's own advantage can be achieved by means of the mass application of nuclear weapons with the simultaneous repulsing of a sudden attack by the air-space means of the enemy." [Ref. 52:p. 164 (emphasis added)] The fundamental connection in Soviet thinking between offense and defense has profound implications for Soviet weapons acquisition strategies and force structure. The Soviets recognize the inevitable and often "revolutionary" advancement of military technology and believe that "the side which first creates an antimissile (antispace) defense will have a most important strategic advantage which would allow the threatening of war or its unleashing without fear of the enemy's retaliatory strikes." [Ref. 17:p. 91 (emphasis added)] Continued advances in BMD technology, as part of what they perceive to be the historical dialectic of offense and defense, are to be expected and exploited. Furthermore, the Soviets would appear to be extremely unlikely to forego research and development in strategic defenses merely because of the current predominance of offensive strategic nuclear weapons.

Despite the limitations imposed by the ABM Treaty on BMD deployments, ballistic missile defenses will in all likelihood continue to play a crucial role in Soviet military strategy.

According to the Soviet literature, BMD is an integral component of their overall national air defense effort, closely coordinated with traditional antiaircraft defense as well antispace defense. In the Soviet mind, national air defense encompasses protection against a continuum of threats -- from hostile aircraft to ballistic missiles to satellites and "space-strike weapons." In the Soviet military, BMD forces probably include dedicated men and equipment whose primary purpose is the destruction of enemy ballistic missiles, both what we in the West call "strategic" ballistic missiles and "tactical" ballistic missiles. Soviet BMD forces are probably under the operational control of the Soviet General Staff, which directs their employment through the main staff of the V-PVO. Currently the primary Soviet BMD weapon is the ground-launched "antimissile", such as the GALOSH. However, electronic countermeasures and, in the future, directed energy and kinetic energy weapons may also play a major role in countering an enemy ballistic missile attack. According to some Soviet authors, naval forces could also play a role in a national BMD system. [Ref. 41:pp. 191-192]

It is important to note that, according to the Soviet military literature, current ground-based BMD weapons may be deployed at both "BMD fire complexes" and at conventional SAM sites. [Ref. 75:p. 598] BMD weapons deployed at SAM sites are truly dual-purpose weapons, able to be used against ballistic missiles (both tactical and intermediate range) as well as against aircraft. This Soviet operational concept is currently being realized with the fielding of the SA-10 and SA-12 missile systems, which possess substantial capabilities against a broad range of airborne targets and

might currently be somewhat effective against certain types of U.S. strategic missiles [Ref. 19:p. 61]. In the absence of a comparable U.S. ability, a Soviet ability to counter strategic missiles that is not restrained by the ABM Treaty creates a serious and widening strategic asymmetry. In the not too distant future, this asymmetry could begin to undermine the credibility and effectiveness of U.S. nuclear retaliatory capabilities, with serious consequences for the overall U.S.-Soviet strategic balance.

Furthermore, the Soviets consider BMD antimissiles to be one of their primary weapons for destroying enemy satellites. [Ref. 83:p. 596] This point is significant in that the Soviet GALOSH antimissile has been operationally deployed since the late 1960s, giving the Soviets both a limited BMD capability and an operational ASAT for the last twenty years. This capability has been enhanced with the deployment of the improved GALOSH.

Manned space platforms have played a particularly important role in Soviet conceptualizations of space warfare and BMD, as well as in Soviet thinking about the future of armed conflict in general. The Soviets feel that "a manned space lab is one of the basic means for conquering space for military purposes." [Ref. 41:p. 96] Furthermore, according to the Soviet literature, "the use of laser weapons is considered to be most probable on manned space interceptors and space defense labs." [Ref. 41:p. 250] Manned space systems could overcome many of the Soviet technological disadvantages in areas crucial to a space-based BMD system. In fact, the Soviet "Mir" space station could be particularly suited for rapid expansion into a space-based BMD weapons platform through the attachment of special reconnaissance or weapons modules.

As the Soviet literature clearly shows, Soviet thinking on defense against ballistic missile attack is fundamentally different from that in the West. In order to more fully

understand Soviet intentions, therefore, both in BMD weapons programs and in arms control negotiations with the West, it is essential to accurately understand the larger context of Soviet thinking on the role of BMD in a future war. Analysis of open-source Soviet military literature can provide significant insights into these Soviet intentions.

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OSWR-NSD
5G00 Headquarters
Washington, DC 20505

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2520-F S. Walter Reed Dr.
Arlington, VA 22206

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U.S. Naval Security Group Activity Edzell
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FPO New York 09518